**An Investigation by High Definition Mineralogy into**

# FIVE CORE SAMPLES FROM THE MANIITSOQ DEPOSIT, SOUTHWEST GREENLAND

prepared for

## NORTH AMERICAN NICKEL INC.

Project 14021-103 – Final Report
February 26, 2016



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# *Executive Summary*

North American Nickel Inc. submitted five drill core samples from mineralized norite intrusions at regional exploration targets from the Maniitsoq Project for a mineralogical study. The purpose of this study was to determine the modal mineralogy, the mineral texture, nickel, cobalt, and copper deportment, and the liberation, association, and exposure of the nickel, copper, and iron sulphides of each sample. Mineralogical analysis was conducted with QEMSCAN (Quantitative Evaluation of Minerals by Scanning Electron Microscopy), X-ray Diffraction (XRD), and Electron Microprobe Analysis (EMPA). Samples were analyzed both as core pieces (to determine the mineral textures) and also crushed to 90% passing 150 µm for mineralogy characteristics (liberation, association, exposure) to support possible processing.

## Crushed Samples

The following data are based on the samples being stage pulverized to 90% passing 150 µm.

Modal Mineralogy

The samples are predominantly comprised of pyrrhotite, orthopyroxene, and amphibole, and moderate to minor feldspars, clinopyroxene, and pyrite (Table 1). Pentlandite is the main nickel bearing sulphide varying from ~7% to 10%, with chalcopyrite occurring in minor to trace amounts. Talc was identified in sample D01618, which was confirmed by XRD.

**Table 1: Mineral Abundance of the Crushed Sample**

| Sample | | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Fraction (P90) | | 150 µm | 150 µm | 150 µm | 150 µm | 150 µm |
| Mass Size Distribution (%) | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Calculated ESD Particle Size (µm) | | 26 | 30 | 28 | 28 | 29 |
| Mineral Mass (%) | Pentlandite | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |
| | Chalcopyrite | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |
| | Pyrrhotite | 34.3 | 26.9 | 49.6 | 30.5 | 33.1 |
| | Pyrite | 3.33 | 2.17 | 2.58 | 22.3 | 1.86 |
| | Quartz | 0.23 | 0.33 | 0.49 | 0.43 | 0.09 |
| | Feldspars | 9.65 | 16.5 | 5.07 | 2.16 | 5.78 |
| | Orthopyroxene | 14.8 | 19.7 | 9.11 | 6.08 | 23.7 |
| | Clinopyroxene | 5.01 | 8.24 | 3.87 | 3.81 | 13.3 |
| | Amphibole | 16.0 | 15.9 | 18.5 | 25.1 | 9.12 |
| | Biotite/Phlogopite | 0.30 | 0.67 | 0.31 | 0.22 | 0.06 |
| | Talc | 5.06 | 0.22 | 0.17 | 0.14 | 0.54 |
| | Chlorite | 0.08 | 0.05 | 0.06 | 0.03 | 0.04 |
| | Other Silicates | 0.34 | 0.11 | 0.05 | 0.03 | 0.10 |
| | Carbonates | 1.07 | 0.90 | 0.89 | 1.11 | 0.60 |
| | Oxides | 0.08 | 0.04 | 0.03 | 0.04 | 0.02 |
| | Apatite | 0.05 | 0.02 | 0.13 | 0.11 | 0.02 |
| | Other | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Electron Microprobe Analysis

Electron Microprobe Analysis was carried out on the main sulphides and silicate minerals to determine their chemical compositions and to define the possible carriers of nickel; the average vales can be found in Table 2 and Table 3.

**Table 2: EMPA Sulphides Summary**

| Minerals | Elements (wt%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | As | Ni | S | Fe | Co | Cu | Zn |
| Chalcopyrite | <DL | <DL | 35.1 | 30.2 | <DL | 34.8 | <DL |
| Pentlandite | <DL | 35.9 | 33.2 | 29.6 | 0.91 | <DL | <DL |
| Pyrite | <DL | <DL | 53.5 | 45.9 | 0.79 | <DL | <DL |
| Pyrrhotite | <DL | 0.51 | 39.4 | 60.1 | <DL | <DL | <DL |

**Table 3: EMPA Silicates Summary**

| Minerals | Elements (wt%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Na | Mg | K | Ni | Si | Al | Ca | Fe | Ti | Mn | Cr |
| Amphibole | 0.29 | 10.8 | 0.41 | 0.06 | 23.3 | 3.44 | 8.62 | 6.17 | 0.52 | 0.13 | 0.26 |
| Biotite | 0.01 | 11.6 | 8.51 | 0.08 | 17.8 | 8.28 | 0.03 | 7.06 | 1.98 | <DL | 0.52 |
| Clinopyroxene | 0.14 | 9.40 | <DL | 0.03 | 24.6 | 0.97 | 16.3 | 4.65 | 0.14 | 0.15 | 0.19 |
| Orthopyroxene | <DL | 15.8 | <DL | 0.04 | 25.1 | 0.63 | 0.28 | 13.5 | 0.04 | 0.39 | 0.08 |
| Talc | 0.04 | 17.6 | 0.04 | 0.12 | 28.8 | 0.62 | 0.02 | 3.00 | 0.03 | <DL | 0.07 |

Elemental Deportment

By combining EMPA data into the QEMSCAN dataset, elemental deportment was calculated. The elemental deportment of nickel, cobalt, and copper is summarized in Table 4. On average, pentlandite carries 94% of the nickel and pyrrhotite 5.5%. Silicates account for trace amounts of nickel (<0.6%). On average, pentlandite carries 70% of the cobalt and pyrite 30%. Chalcopyrite accounts for 100% of the copper.

**Table 4: Nickel, Cobalt, Copper Deportment Summary**

| Deportment | Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Ni | Pentlandite | 94.5 | 94.4 | 91.9 | 93.4 | 95.2 |
| | Pyrrhotite | 4.90 | 4.94 | 7.67 | 5.92 | 4.36 |
| | Orthopyroxene | 0.15 | 0.25 | 0.10 | 0.08 | 0.22 |
| | Clinopyroxene | 0.05 | 0.10 | 0.04 | 0.05 | 0.11 |
| | Amphibole | 0.25 | 0.32 | 0.32 | 0.54 | 0.13 |
| | Biotite/Phlogopite | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 |
| | Talc | 0.17 | 0.01 | 0.01 | 0.01 | 0.02 |
| Co | Pentlandite | 76.6 | 79.6 | 79.2 | 26.4 | 86.5 |
| | Pyrite | 23.4 | 20.4 | 20.8 | 73.6 | 13.5 |
| Cu | Chalcopyrite | 100 | 100 | 100 | 100 | 100 |

Potential Recovery

The potential mineral recovery for pentlandite and chalcopyrite is summarized in Table 5. The following data are based on current grinding at 90% passing 150 µm. Potential recovery can be defined as the percent of a mineral that can potentially be recovered through flotation. It is calculated based on the liberation, association and exposure of the grains. It is used as a prediction of recovery but does not take into considerations other factors that could negatively impact recovery such as pulp rheology from talc etc. There is potential for the effects of talc to be managed by the addition of carboxymethyl cellulose, or other dispersants and depressants.

On average, 97% of pentlandite is potentially recoverable through flotation to a rougher concentrate, whereas 3% is non-recoverable due to poor exposure or is locked.

On average, 89% chalcopyrite is potentially recoverable, whereas 11% is non-recoverable due to poor exposure or is locked.

**Table 5: Potential Recovery**

| Mineral | Potential Recovery | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Pentlandite | Potentially Recoverable | 96.7 | 97.0 | 97.0 | 98.0 | 97.3 |
| | Non-Recoverable | 3.34 | 3.01 | 3.00 | 1.96 | 2.68 |
| Chalcopyrite | Potentially Recoverable | 85.8 | 84.6 | 92.5 | 91.1 | 92.0 |
| | Non-Recoverable | 14.2 | 15.4 | 7.54 | 8.87 | 7.95 |

In terms of nickel recovery, taking into account the percentage of nickel in pentlandite and the recovery of pentlandite, the maximum amount of nickel that can be recovered varies by sample but ranges from 89% (D01620) to 93% (D01622). For copper recovery; the range is from 85% (D01618) to 92% for samples D01620 and D01622.

# *Introduction*

This report describes a mineralogical test program using High Definition Mineralogy, including QEMSCAN technology (Quantitative Evaluation of Materials by Scanning Electron Microscopy), X-ray Diffraction (XRD), Electron Microprobe Analysis (EMPA) and chemical analysis on five drill core samples. The samples were submitted by North American Nickel Inc. and are from mineralized norite intrusions at regional exploration targets from the Maniitsoq Project, Southwest Greenland. The purpose of this test program was to determine the overall mineral assemblage, the nickel, cobalt and copper deportment and the liberation, association and exposure of the nickel, copper and iron bearing sulphide minerals.

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# Testwork Summary

## 1. Sample Receipt and Preparation

Five core samples were submitted to the SGS Canada Inc. Burnaby Advanced Mineralogy Facility by North American Nickel Inc. The project number CAVM-14021-103 was assigned to the testwork.

The five drill core samples were inventoried, weighed, and a designated area of each core was cut and one polished epoxy rock mount was prepared from each sample. They were submitted for QEMSCAN analysis by Field Scan mode of operation.

Between 50-100g of the off cuts from each sample were stage pulverized to a $P_{90}$ of 150 μm and the reject was stored. Approximately 20 g was riffled from each sample and submitted for chemical analysis including sulphur by Leco, copper, nickel, cobalt, and whole rock analysis by X-ray fluorescence (XRF). Approximately 10 g was riffled and pulverized from two of the samples (D01618 and D01622) and submitted for qualitative X-Ray Diffraction (XRD). The remainder from each sample was further reduced by micro-riffler to produce approximately 1 g sub-samples for polished section preparation. A total of ten graphite impregnated polished epoxy grain mounts were prepared; two polished sections for each sample. These sections were submitted for QEMSCAN using the Particle Mineral Analysis mode of operation. All polished sections were carbon coated and submitted for QEMSCAN analysis. The polished sections were submitted for Electron Microprobe Analysis (EMPA) at McGill University following QEMSCAN analysis.

The certificates of chemical analysis are presented in Appendix A, the XRD report is presented in Appendix B, EMPA data is presented in Appendix C and QEMSCAN data is presented in Appendix D.

## 2. Operational Modes and Quality Control

### 2.1. Operational Modes

Two modes of QEMSCAN analysis were used for this project: Field Scan (FS) and Particle Mineral Analysis (PMA).

The FS mode of measurement maps a core sample that has been mounted in the polished section. It collects a chemical spectrum at a set interval within the field of view. Each field of view is then processed offline and a pseudo image of the core sample is produced.

The PMA is a two-dimensional mapping analysis aimed at resolving liberation and locking characteristics of a generic set of particles. The PMA mode scans the polished section and provides a statistically robust population of mineral identifications based on the X-ray chemistry of minerals. A pre-defined number of particles are mapped at a point spacing selected to spatially resolve and describe mineral textures and associations. This mode is often selected to characterize concentrate products, as both gangue and value minerals report in statistically abundant quantities to be resolved.

It should be noted that the energy dispersive X-ray characteristics for magnetite and hematite are nearly identical and that these two minerals cannot reliably be distinguished by QEMSCAN. Light elements such as Li, B, C, Be, O, and H also cannot be discriminated by the QEMSCAN analysis.

It must be noted, that due to the difference in grain size, all size fractions contain particles that are close to the measurement area (~3 μm) and the spacing of the measurement points and therefore can encounter less precision in the measurements. In addition, the X-ray beam can scatter at the edges of particles and can lead to inaccurate analytical results. As the particles become smaller, the edges constitute a larger percentage of the total particle mass. Therefore, some bias may be introduced, especially in the fine fraction, and caution is advised in interpreting the results in this particular fraction.

### 2.2. X-Ray Diffraction Analysis

Qualitative XRD was performed for QEMSCAN set up and quality control purposes. The XRD results are summarized in Table 6 and the complete XRD report with the patterns are presented in Appendix B. In general, the XRD results are consistent with the QEMSCAN analysis.

Both D01618 and D01622 consist of major amounts of pyrrhotite, and moderate amounts of pyroxene and pentlandite. Talc is noted as being present in sample D01618.

**Table 6: Summary of XRD Analysis**

Crystalline Mineral Assemblage (relative proportions based on peak height)

| Sample ID | Major | Moderate | Minor | Trace |
|---|---|---|---|---|
| D 01618 | pyrrhotite | pyroxene, pentlandite | pyrite, amphibole, plagioclase | *quartz, *talc, *magnetite |
| D 01622 | pyrrhotite | pentlandite, pyroxene | amphibole, pyrite, plagioclase | *quartz, *magnetite |

* tentative identification due to low concentrations, diffraction line overlap or poor crystallinity

### 2.3. QEMSCAN Assay Reconciliation

Each polished section (from the crushed samples) was submitted for mineralogical analysis using the QEMSCAN PMA method. All data was processed with the iExplorer software version 5.2. The QEMSCAN mineralogical assays were regressed with the chemical assays (Figure 1). Refer to Appendix A for the certificates of chemical analysis, and Appendix D for a direct comparison of assay values.

The QEMSCAN calculated assays show good correlation with the chemical assays with the overall correlation as measured by the R-squared criteria of 0.999 and a slope (m) of 0.993.

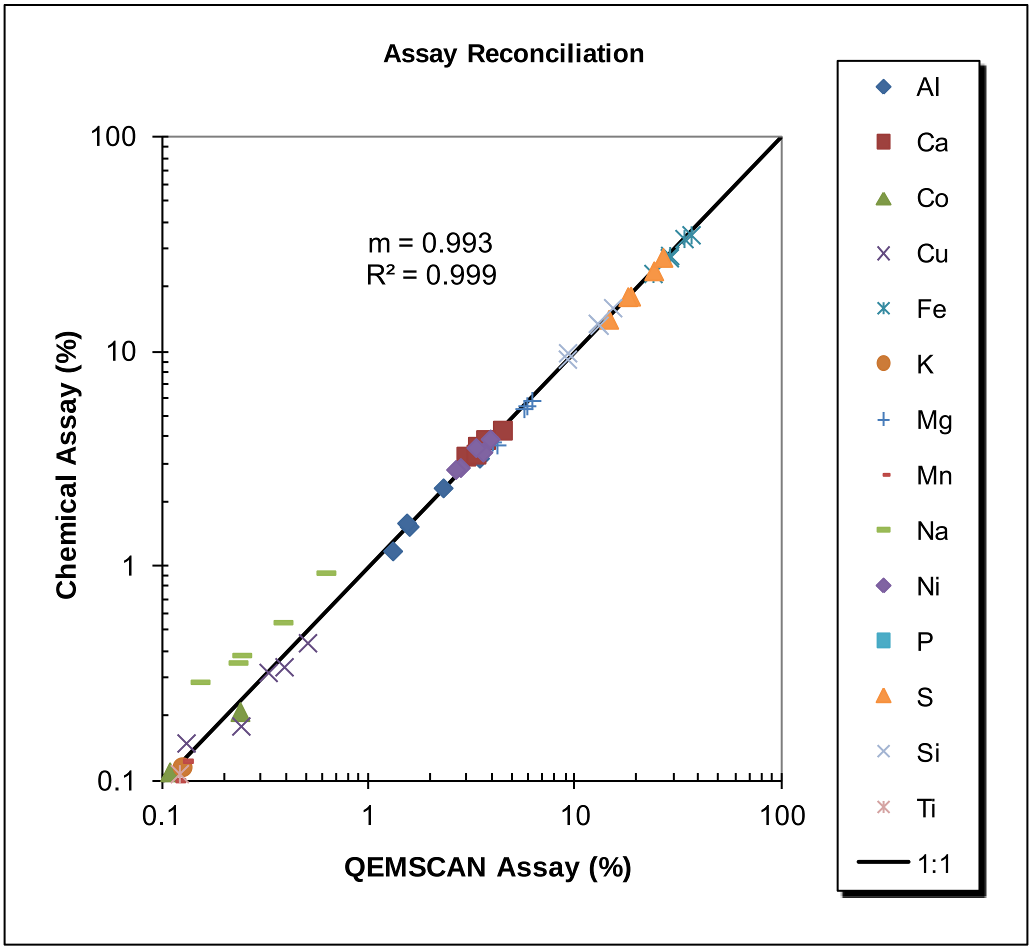



**Figure 1: QEMSCAN and Direct Assay Reconciliation**

## 3. Modal Mineralogy and Grain Size

### 3.1. Modal Mineralogy

#### 3.1.1. Intact Drill Core Samples

The modal abundance of minerals (given in weight percent) in the core samples is presented in Table 7 and graphically in Figure 2.

The D01618 sample is predominantly composed of pyrrhotite (43.4%), amphibole (16.1%), and orthopyroxene (15.7%), with minor (1-10%) feldspars, clinopyroxene, talc, and pyrite. Pentlandite and chalcopyrite are 7.97% and 0.22%, respectively.

The D01619 sample is predominantly composed of orthopyroxene (25.8%), pyrrhotite (19.2%), amphibole (20.1%), pentlandite (12.1%), and clinopyroxene (11.0%), with minor (1-10%) orthopyroxene, pentlandite, feldspars, clinopyroxene, and pyrite. Chalcopyrite is 1.62%.

The D01620 sample is predominantly composed of pyrrhotite (55.2%), amphibole (14.9%), and pentlandite (12.5%), with minor orthopyroxene, clinopyroxene, feldspars, and pyrite. Chalcopyrite is 0.54%.

The D01621 sample is predominantly composed of pyrrhotite (33.9%), amphibole (24.9%), and pyrite (22.7%), with minor orthopyroxene, clinopyroxene, and feldspars. Pentlandite and chalcopyrite are 6.94% and 1.11%, respectively.

The D01622 sample is predominantly composed of pyrrhotite (40.3%), orthopyroxene (23.6%), pentlandite (11.8%), with minor (clinopyroxene, amphibole, and pyrite. Chalcopyrite is 2.23%.

**Table 7: Modal Abundance of Core Samples**

| Sample | | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Fraction (P90) | | Core | Core | Core | Core | Core |
| Mass Size Distribution (%) | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Mineral Mass (%) | Pentlandite | 7.97 | 12.1 | 12.5 | 6.94 | 11.8 |
| | Chalcopyrite | 0.22 | 1.62 | 0.54 | 1.11 | 2.23 |
| | Pyrrhotite | 43.4 | 19.2 | 55.2 | 33.9 | 40.3 |
| | Pyrite | 2.65 | 3.07 | 2.09 | 22.7 | 3.63 |
| | Quartz | 0.27 | 0.34 | 0.36 | 0.27 | 0.12 |
| | Feldspars | 3.09 | 5.88 | 3.42 | 1.05 | 0.51 |
| | Orthopyroxene | 15.7 | 25.8 | 6.37 | 4.95 | 23.6 |
| | Clinopyroxene | 6.13 | 11.0 | 3.96 | 3.45 | 9.91 |
| | Amphibole | 16.1 | 20.1 | 14.9 | 24.9 | 7.48 |
| | Biotite/Phlogopite | 0.09 | 0.28 | 0.14 | 0.07 | 0.01 |
| | Talc | 3.63 | 0.11 | 0.07 | 0.06 | 0.13 |
| | Chlorite | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Other Silicates | 0.05 | 0.07 | 0.03 | 0.02 | 0.04 |
| | Carbonates | 0.62 | 0.46 | 0.31 | 0.59 | 0.28 |
| | Oxides | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| | Apatite | 0.01 | 0.01 | 0.04 | 0.02 | 0.00 |
| | Other | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

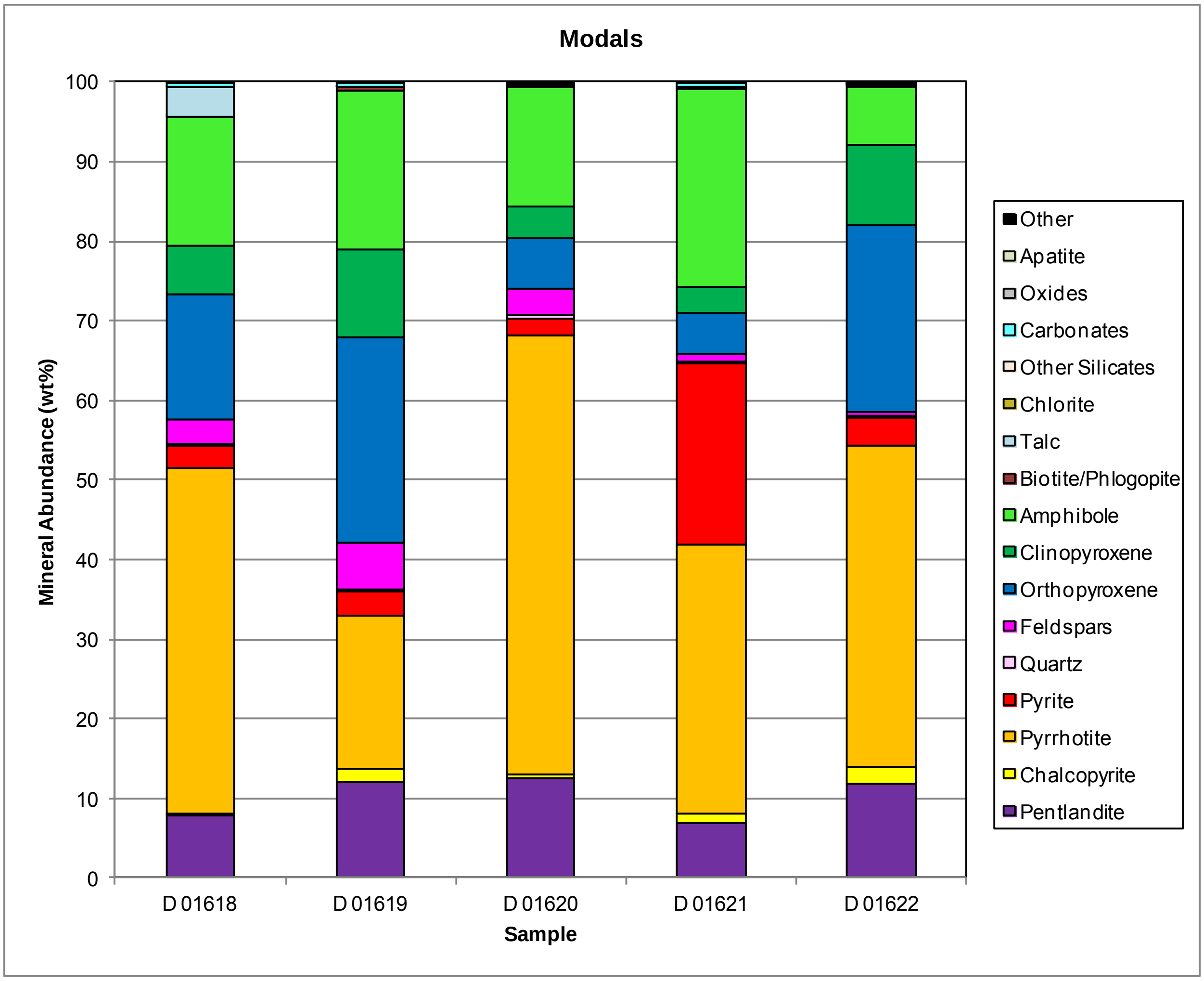



**Figure 2: Mineral Abundance of Core Samples**

### 3.1.2. Crushed Samples

The modal abundance of minerals in the crushed samples is presented in Table 8 and graphically in Figure 3. The modal mineralogy data are given in weight percent.

The D01618 sample is predominantly composed of pyrrhotite (34.3%), amphibole (16.0%), and orthopyroxene (14.8%), with minor (1-10%) feldspars, talc, clinopyroxene, pyrite, and carbonates. Pentlandite and chalcopyrite are 9.39% and 0.37%, respectively.

The D01619 sample is predominantly composed of pyrrhotite (26.9%), orthopyroxene (19.7%), feldspars (16.5%), and amphibole (15.9%), with minor (1-10%) clinopyroxene, pentlandite, and pyrite. Pentlandite and chalcopyrite are 7.30% and 0.94%, respectively.

The D01620 sample is predominantly composed of pyrrhotite (49.6%) and amphibole (18.5%), with minor (1-10%) orthopyroxene, feldspars, clinopyroxene, and pyrite. Pentlandite and chalcopyrite are 8.44% and 0.69%, respectively.

The D01621 sample is predominantly composed of pyrrhotite (30.5%), amphibole (25.1%), and pyrite (22.3%), with minor (1-10%) orthopyroxene, clinopyroxene, feldspars, and carbonates. Pentlandite and chalcopyrite are 6.85% and 1.12%, respectively.

The D01622 sample is predominantly composed of pyrrhotite (33.1%), orthopyroxene (23.7%), clinopyroxene (13.3%) and pentlandite (10.3%), with minor (1-10%) amphibole, feldspars, and pyrite. Chalcopyrite is 1.45%.

**Table 8: Modal Abundance of Crushed Samples**

| Sample | | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Fraction (P90) | | 150 µm | 150 µm | 150 µm | 150 µm | 150 µm |
| Mass Size Distribution (%) | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Calculated ESD Particle Size (µm) | | 26 | 30 | 28 | 28 | 29 |
| Mineral Mass (%) | Pentlandite | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |
| | Chalcopyrite | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |
| | Pyrrhotite | 34.3 | 26.9 | 49.6 | 30.5 | 33.1 |
| | Pyrite | 3.33 | 2.17 | 2.58 | 22.3 | 1.86 |
| | Quartz | 0.23 | 0.33 | 0.49 | 0.43 | 0.09 |
| | Feldspars | 9.65 | 16.5 | 5.07 | 2.16 | 5.78 |
| | Orthopyroxene | 14.8 | 19.7 | 9.11 | 6.08 | 23.7 |
| | Clinopyroxene | 5.01 | 8.24 | 3.87 | 3.81 | 13.3 |
| | Amphibole | 16.0 | 15.9 | 18.5 | 25.1 | 9.12 |
| | Biotite/Phlogopite | 0.30 | 0.67 | 0.31 | 0.22 | 0.06 |
| | Talc | 5.06 | 0.22 | 0.17 | 0.14 | 0.54 |
| | Chlorite | 0.08 | 0.05 | 0.06 | 0.03 | 0.04 |
| | Other Silicates | 0.34 | 0.11 | 0.05 | 0.03 | 0.10 |
| | Carbonates | 1.07 | 0.90 | 0.89 | 1.11 | 0.60 |
| | Oxides | 0.08 | 0.04 | 0.03 | 0.04 | 0.02 |
| | Apatite | 0.05 | 0.02 | 0.13 | 0.11 | 0.02 |
| | Other | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

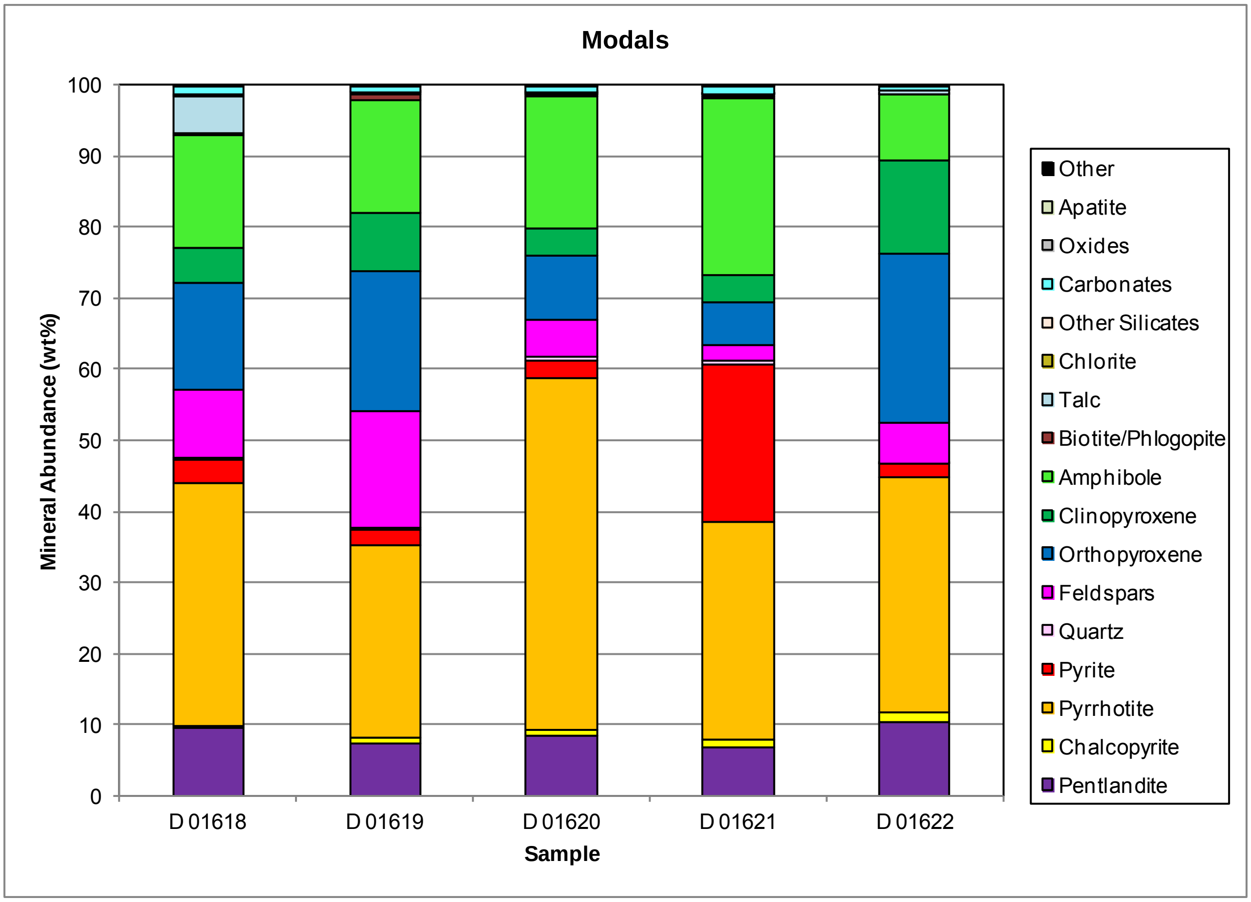



**Figure 3: Mineral Abundance of Crushed Samples**

### 3.2. Grain Size – Crushed Samples

The $D_{50}$ (µm) or 50% passing value from the cumulative grain size distribution of pentlandite, chalcopyrite, Fe-sulphides, hard silicates, soft silicates, carbonates, oxides, and the overall particle size distribution for the samples are presented in Table 9. The $D_{50}$ is the medium grain size of the particles within the sample, which 50% of the particles being coarser and 50% of the particles being finer than the size stated.

In relative terms, the iron sulphides and hard silicates are coarser (42 µm to 56 µm) than the pentlandite which is coarser (38 µm to 43 µm) than the chalcopyrite in most cases (20 µm to 32 µm). The overall particle size shows a $D_{50}$ from 48 µm to 55 µm.

The cumulative grain size distribution graphs are presented in Appendix D.

**Table 9: $D_{50}$ Grain Size Distribution**

| Mineral D50 | Grain Size (µm) | | | | |
|---|---|---|---|---|---|
| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
| Pentlandite | 43 | 38 | 40 | 41 | 41 |
| Chalcopyrite | 19 | 23 | 32 | 27 | 29 |
| Fe-Sulphides | 46 | 51 | 52 | 56 | 44 |
| Hard Silicates | 43 | 55 | 48 | 49 | 55 |
| Soft Silicates | 25 | 19 | 15 | 17 | 14 |
| Carbonates | 16 | 16 | 17 | 21 | 16 |
| Oxides | 14 | 13 | 13 | 13 | 12 |
| Particle | 48 | 55 | 50 | 52 | 51 |

# 4. Elemental Deportment

The elemental deportment data was calculated using the mineral abundances from the QEMSCAN analysis and the average mineral composition established by EMPA data.

- Pentlandite contains an average 35.9% Ni and 29.6% Fe by weight. Pentlandite accounts for >90% of the nickel and pyrrhotite between 4-8% and the remainder by silicate minerals.
- Pentlandite and pyrite contain on average 0.91% and 0.79% cobalt. Pentlandite accounts for >75% of the cobalt apart from sample D 01621 where pyrite accounts for 74%.
- Copper is exclusively carried by chalcopyrite.

## 4.1. Nickel Deportment

Nickel was found to occur in primarily in pentlandite, with trace amounts occurring in pyrrhotite, orthopyroxene, clinopyroxene, amphibole, biotite, and talc. The average composition of the nickel bearing sulphide and silicate minerals is shown in Table 10 and Table 11 respectively.

**Table 10: Average Elemental Composition of Nickel Bearing Sulphides by EMPA**

| Mineral | As | Ni | S | Fe | Co | Cu | Zn |
|---|---|---|---|---|---|---|---|
| Pentlandite | <DL | 35.9 | 33.2 | 29.6 | 0.91 | <DL | <DL |
| Pyrrhotite | <DL | 0.51 | 39.4 | 60.1 | <DL | <DL | <DL |

**Table 11: Average Elemental Composition of Nickel Bearing Silicates by EMPA**

| Mineral | Na | Mg | K | Ni | Si | Al | Ca | Fe | Ti | Mn | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Orthopyroxene | <DL | 15.8 | <DL | 0.04 | 25.1 | 0.63 | 0.28 | 13.5 | 0.04 | 0.39 | 0.08 |
| Clinopyroxene | 0.14 | 9.40 | <DL | 0.03 | 24.6 | 0.97 | 16.3 | 4.65 | 0.14 | 0.15 | 0.19 |
| Amphibole | 0.29 | 10.8 | 0.41 | 0.06 | 23.3 | 3.44 | 8.62 | 6.17 | 0.52 | 0.13 | 0.26 |
| Biotite/Phlogopite | 0.01 | 11.6 | 8.51 | 0.08 | 17.8 | 8.28 | 0.03 | 7.06 | 1.98 | <DL | 0.52 |
| Talc | 0.04 | 17.6 | 0.04 | 0.12 | 28.8 | 0.62 | 0.02 | 3.00 | 0.03 | <DL | 0.07 |

A summary table of the deportment of nickel by QEMSCAN is shown in Table 12, in all samples nickel is primarily carried in pentlandite (varying from 92% to 95% of the global nickel occurrence), and there is minor amounts in pyrrhotite (4% to ~8%). Silicate minerals also account for trace amounts of nickel.

**Table 12: Nickel Deportment (Normalized)**

| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Pentlandite | 94.5 | 94.4 | 91.9 | 93.4 | 95.2 |
| Pyrrhotite | 4.90 | 4.94 | 7.67 | 5.92 | 4.36 |
| Orthopyroxene | 0.15 | 0.25 | 0.10 | 0.08 | 0.22 |
| Clinopyroxene | 0.05 | 0.10 | 0.04 | 0.05 | 0.11 |
| Amphibole | 0.25 | 0.32 | 0.32 | 0.54 | 0.13 |
| Biotite/Phlogopite | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 |
| Talc | 0.17 | 0.01 | 0.01 | 0.01 | 0.02 |
| Total | 100 | 100 | 100 | 100 | 100 |

## 4.2. Cobalt Deportment

Cobalt was found to occur in trace amounts in pentlandite and pyrite; the average composition of the cobalt bearing minerals is shown in Table 13.

**Table 13: Average Elemental Composition of Cobalt Bearing Sulphides**

| Mineral | As | Ni | S | Fe | Co | Cu | Zn |
|---|---|---|---|---|---|---|---|
| Pentlandite | <DL | 35.9 | 33.2 | 29.6 | 0.91 | <DL | <DL |
| Pyrite | <DL | <DL | 53.5 | 45.9 | 0.79 | <DL | <DL |

The deportment of cobalt is shown in Table 14. In D01621 the cobalt is primarily carried in pyrite, for the remaining samples cobalt is primarily carried in pentlandite. In this sample pyrite is the dominant iron sulphide at 22% whereas for all of the other samples pyrite is less than 4%.

**Table 14: Cobalt Deportment (Normalized)**

| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Pentlandite | 76.6 | 79.6 | 79.2 | 26.4 | 86.5 |
| Pyrite | 23.4 | 20.4 | 20.8 | 73.6 | 13.5 |
| Total | 100 | 100 | 100 | 100 | 100 |

## 4.3. Copper Elemental Deportment

Copper was found to occur in chalcopyrite; the average composition of chalcopyrite is shown in Table 15. Copper exclusively occurs as chalcopyrite in these samples; the deportment of copper is shown in Table 16.

**Table 15: Average Elemental Composition of Copper Bearing Sulphides**

| Mineral | As | Ni | S | Fe | Co | Cu | Zn |
|---|---|---|---|---|---|---|---|
| Chalcopyrite | <DL | <DL | 35.1 | 30.2 | <DL | 34.8 | <DL |

**Table 16: Copper Deportment (Normalized)**

| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Chalcopyrite | 100 | 100 | 100 | 100 | 100 |
| Total | 100 | 100 | 100 | 100 | 100 |

## 5. Liberation, Association and Exposure

The liberation, association and exposure characteristics of the chalcopyrite, iron sulphides, and pentlandite were examined and are summarized in Table 17 and in Table 18, respectively. The complete liberation, association, and exposure data are presented in Appendix D.

Chalcopyrite liberation ranges from 57 to 75%; that of pyrite from 94 to 98%; and that of pentlandite from 86 to 92% in all samples.

Exposure of minerals can be used to look at the floatability of the particles, with minerals having a surface exposure of approximately >20% considered adequate for flotation. Pyrrhotite and pyrite have been grouped as iron sulphides for the exposure calculations.

Pentlandite displays good exposure with an average of 97% of the particles >20% exposed. Chalcopyrite and iron sulphides also show good exposure with an average of 89% and 99% >20% exposure, respectively.

**Table 17: Liberation and Association**

| Mineral | Liberation/Associaton | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Chalcopyrite | Liberated | 57.0 | 66.1 | 70.9 | 75.2 | 70.8 |
| | Fe Sulphides | 17.8 | 9.77 | 16.2 | 15.0 | 12.9 |
| | Pentlandite | 1.29 | 2.84 | 0.66 | 0.69 | 0.78 |
| | Fe Sulphide:Pentlandite | 4.55 | 8.48 | 5.88 | 5.76 | 10.4 |
| | Hard Silicates | 3.70 | 6.95 | 2.03 | 0.88 | 1.52 |
| | Soft Silicates | 0.05 | 0.02 | 0.01 | 0.21 | 0.07 |
| | Carbonates | 0.02 | 0.05 | 0.00 | 0.01 | 0.02 |
| | Oxides | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| | Complex | 15.6 | 5.81 | 4.31 | 2.29 | 3.58 |
| Fe Sulphides | Liberated | 94.0 | 95.1 | 97.0 | 97.5 | 94.7 |
| | Pentlandite | 2.42 | 2.32 | 1.27 | 1.12 | 2.21 |
| | Chalcopyrite | 0.17 | 0.35 | 0.40 | 0.49 | 0.83 |
| | Chalcopyrite:Pentlandite | 0.15 | 0.53 | 0.13 | 0.06 | 0.75 |
| | Hard Silicates | 1.42 | 1.03 | 0.74 | 0.56 | 0.92 |
| | Soft Silicates | 0.08 | 0.01 | 0.02 | 0.00 | 0.01 |
| | Carbonates | 0.04 | 0.02 | 0.03 | 0.02 | 0.02 |
| | Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| | Complex | 1.69 | 0.60 | 0.39 | 0.22 | 0.58 |
| Pentlandite | Liberated | 86.4 | 83.5 | 88.8 | 91.8 | 88.3 |
| | Fe Sulphides | 9.93 | 9.83 | 8.89 | 6.35 | 7.35 |
| | Chalcopyrite | 0.03 | 0.51 | 0.07 | 0.05 | 0.10 |
| | Chalcopyrite:Fe Sulphide | 0.93 | 3.60 | 0.74 | 0.47 | 2.57 |
| | Hard Silicates | 0.77 | 1.07 | 0.64 | 0.65 | 0.65 |
| | Soft Silicates | 0.06 | 0.01 | 0.02 | 0.00 | 0.03 |
| | Carbonates | 0.08 | 0.08 | 0.03 | 0.10 | 0.01 |
| | Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Complex | 1.82 | 1.38 | 0.79 | 0.62 | 1.01 |

**Table 18: Exposure**

| Mineral | Exposure | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Chalcopyrite | Exposed | 55.5 | 63.0 | 68.0 | 72.5 | 68.6 |
| | 20-80% Exposed | 30.2 | 21.6 | 24.5 | 18.6 | 23.5 |
| | 0-20% Exposed | 12.6 | 14.5 | 6.86 | 8.39 | 7.55 |
| | Locked | 1.65 | 0.95 | 0.68 | 0.48 | 0.41 |
| Fe Sulphides | Exposed | 90.3 | 91.9 | 94.8 | 96.1 | 91.7 |
| | 20-80% Exposed | 8.75 | 7.26 | 4.75 | 3.57 | 7.74 |
| | 0-20% Exposed | 0.89 | 0.80 | 0.46 | 0.29 | 0.56 |
| | Locked | 0.05 | 0.02 | 0.01 | 0.01 | 0.02 |
| Pentlandite | Exposed | 81.6 | 75.9 | 83.7 | 87.0 | 82.8 |
| | 20-80% Exposed | 15.1 | 21.0 | 13.3 | 11.0 | 14.5 |
| | 0-20% Exposed | 3.09 | 2.87 | 2.85 | 1.85 | 2.60 |
| | Locked | 0.25 | 0.14 | 0.15 | 0.11 | 0.08 |

## 6. Potential Recovery

The potential recovery characteristics of the pentlandite and chalcopyrite are presented below. All data are in weight percent and are based on the samples being stage pulverized to 90% passing 150 µm.

Potential recovery is the percent of the mineral that can potentially be recovered through flotation. It is calculated using the liberation, association and exposure of the grains (on a two dimensional surface area) and is used as a predictive tool based on these characteristics. This data should only be used as a guide to benchmark sample to sample from a rougher recovery perspective. It is important to note that these results are based on the mineralogical analysis and do not reflect any other recovery factors that could occur in the actual metallurgical processes.

**Potential Recovery Classification Terminology**

Grouped under Recoverable Particles

- Pure → 100% of the particle is the mineral of interest
- Free → ≥ 95% of the particle is of the mineral of interest
- Liberated → ≥80% of the particle is of the mineral of interest
- Mineral of Interest: Fe Sulphide >20% Exposed → Mineral plus pyrite are >95% of the particle with the mineral of interest having ≥20% exposure
- Mineral of Interest: Hard Silicates → Mineral of Interest plus Hard Silicates are ≥95% of the particle area with the mineral of interest having ≥50% exposure
- Recoverable – Complex Grains → Mineral of interest plus two or more other mineral groups with the mineral of interest having ≥20% exposure

Grouped under Non Recoverable Particles

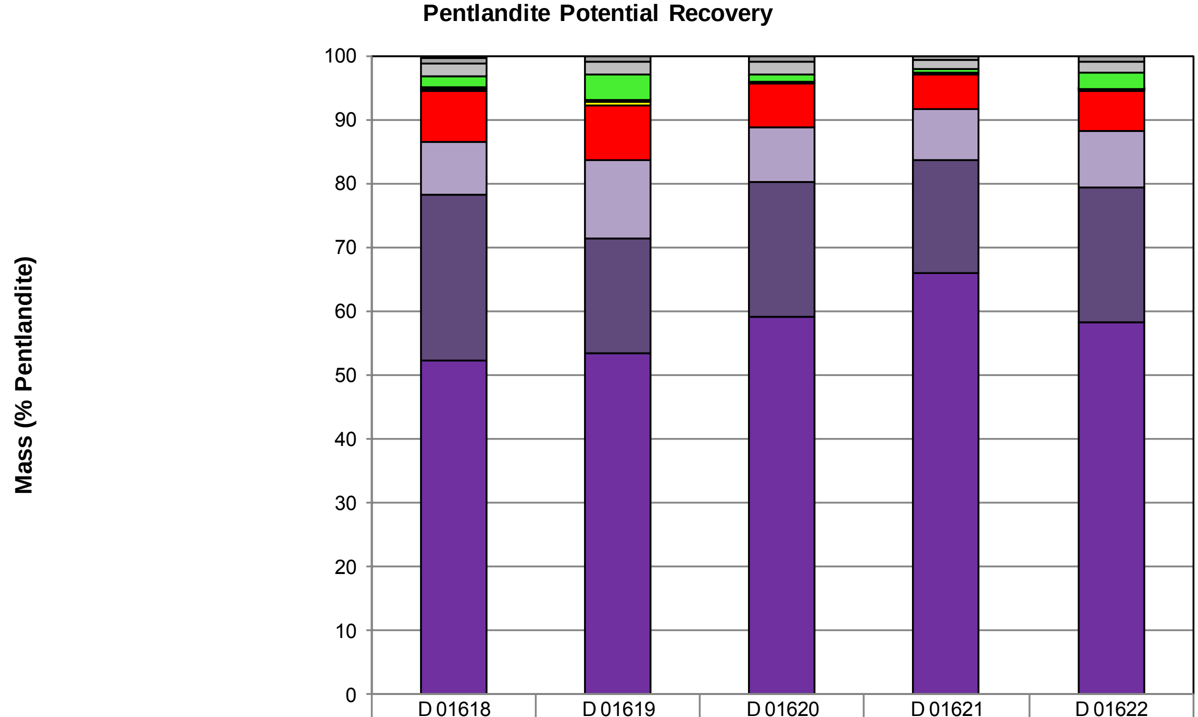
- Mineral of Interest: Fe Sulphide <20% Exposed/locked → Mineral plus pyrite are >95% of the particle with the mineral of interest having <20% exposure
- Non Recoverable – Exposed → Mineral of interest having <20% exposure
- Non Recoverable – Locked → Mineral of interest being totally locked

It is important to note that when minerals are present in trace amounts (about <0.5 wt.%), statistical data may not be adequate to calculate the liberation, association, and exposure and must be taken with caution.

### 6.1. Pentlandite Potential Recovery

The potential recovery of the pentlandite in the samples is summarized in Figure 4. Pentlandite potential recovery image grids, particle maps, and absolute data are presented in Appendix D.

At this grind size, between 96-98% of the pentlandite will be recovered to a rougher concentrate across all samples. Most of the remaining non-recoverable pentlandite is associated with the iron sulphides (1.3-2.2%) or is poorly exposed (0.5-0.9%) with <0.3% locked.




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Non Recoverable - Locked | 0.25 | 0.14 | 0.15 | 0.11 | 0.08 |
| Non Recoverable - Exposed | 0.90 | 0.70 | 0.68 | 0.54 | 0.78 |
| Pent:Fe Sul <20% Exp/Lkd (Non Rec) | 2.19 | 2.17 | 2.18 | 1.31 | 1.82 |
| Recoverable - Complex Grains | 1.67 | 3.90 | 0.97 | 0.72 | 2.52 |
| Pent:Oxides (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Carbonates (Rec) | 0.08 | 0.07 | 0.02 | 0.08 | 0.00 |
| Pent:Soft Silicates (Rec) | 0.03 | 0.01 | 0.02 | 0.00 | 0.03 |
| Pent:Hard Silicates (Rec) | 0.39 | 0.29 | 0.28 | 0.23 | 0.24 |
| Pentlandite:Chalcopyrite (Rec) | 0.01 | 0.43 | 0.06 | 0.02 | 0.04 |
| Pent:Fe Sul >20% Exp (Rec) | 8.10 | 8.77 | 6.82 | 5.22 | 6.21 |
| Lib Pentlandite | 8.07 | 12.2 | 8.59 | 8.19 | 8.78 |
| Free Pentlandite | 26.0 | 18.1 | 21.2 | 17.6 | 21.2 |
| Pure Pentlandite | 52.3 | 53.3 | 59.0 | 66.0 | 58.3 |

**Figure 4: Pentlandite Potential Recovery**

In terms of nickel recovery, taking into account the percentage of nickel in pentlandite and the recovery of pentlandite, the maximum amount of nickel that can be recovered varies by sample but ranges from 89% (D01620) to 93% (D01622), this is summarised in Table 19. Note this is based on mineralogical data and does not take into account any other factors that might affect recovery.

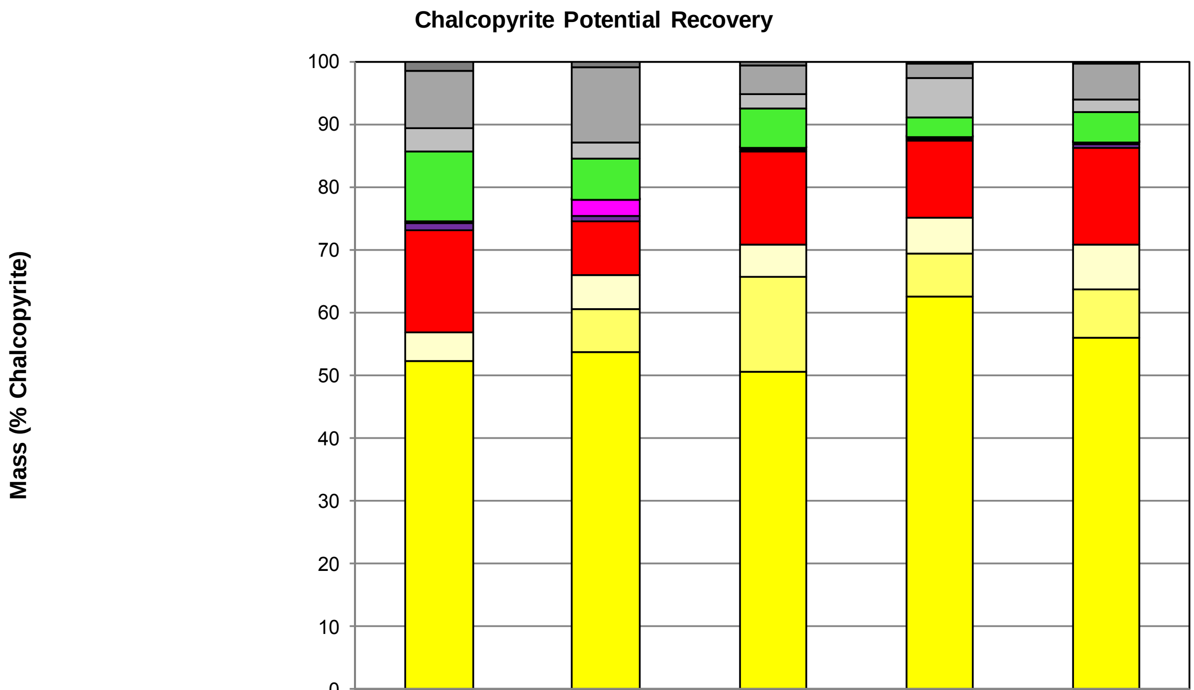
**Table 19: Maximum Nickel Recovery**

| Sample | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Maximum Potential Nickel Recovery (%) | 91 | 92 | 89 | 92 | 93 |

### 6.2. Chalcopyrite Potential Recovery

The potential recovery of the chalcopyrite in the samples is summarized in Figure 5. Chalcopyrite potential recovery image grids, particle maps, and absolute data are presented in Appendix D.

At this grind size, between 85-93% of the chalcopyrite will be recovered to a rougher concentrate across all samples. Most of the remaining non-recoverable chalcopyrite is associated with the iron sulphides (2.0-6.2%) or is poorly exposed (2.2-12%) with 0.4 to 1.7% locked.




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Non Recoverable - Locked | 1.65 | 0.95 | 0.68 | 0.48 | 0.41 |
| Non Recoverable - Exposed | 8.95 | 11.9 | 4.60 | 2.21 | 5.56 |
| Cpy:Fe Sul <20% Exp/Lkd (Non Rec) | 3.64 | 2.56 | 2.27 | 6.18 | 1.99 |
| Recoverable - Complex Grains | 11.1 | 6.64 | 6.22 | 3.30 | 4.95 |
| Cpy:Oxides (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Carbonates (Rec) | 0.00 | 0.03 | 0.00 | 0.00 | 0.02 |
| Cpy:Soft Silicates (Rec) | 0.00 | 0.02 | 0.01 | 0.03 | 0.07 |
| Cpy:Hard Silicates (Rec) | 0.54 | 2.54 | 0.43 | 0.18 | 0.35 |
| Cpy:Pent (Rec) | 0.91 | 0.84 | 0.08 | 0.24 | 0.45 |
| Cpy:Fe Sul >20% Exp (Rec) | 16.2 | 8.43 | 14.8 | 12.2 | 15.5 |
| Lib Cpy | 4.69 | 5.56 | 5.17 | 5.87 | 7.02 |
| Free Cpy | 0.00 | 6.68 | 15.2 | 6.89 | 7.67 |
| Pure Cpy | 52.3 | 53.8 | 50.6 | 62.5 | 56.1 |

**Figure 5: Copper Sulphides Potential Recovery**

In terms of copper recovery, taking into account that all of the copper is accounted for by chalcopyrite and the recovery of chalcopyrite, the maximum amount of copper that can be recovered varies by sample but ranges from 85% (D01619) to 92% (D01620 and D01622), this is summarised in Table 20. Note this is based on mineralogical data and does not take into account any other factors that might affect recovery.

**Table 20: Maximum Copper Recovery**

| Sample | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Maximum Potential Copper Recovery (%) | 86 | 85 | 92 | 91 | 92 |

## 7. Metallurgical Commentary

### Mineral Effect

Recovery of sulphide copper and nickel is performed by flotation. By reviewing baseline mineralogical data, theoretical process models are established and potential complications identified. The modal abundances help identify complexities within the mineral matrix (Table 21).

Host minerals containing payable metals that are targeted for recovery include pentlandite and chalcopyrite.

**Table 21: Modal Commentary**

| | Composite Head Modal Mineral Mass (%) | | | | |
|---|---|---|---|---|---|
| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
| Pentlandite | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |
| Chalcopyrite | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |
| Pyrrhotite | 34.3 | 26.9 | 49.6 | 30.5 | 33.1 |
| Pyrite | 3.33 | 2.17 | 2.58 | 22.3 | 1.86 |
| Quartz | 0.23 | 0.33 | 0.49 | 0.43 | 0.09 |
| Feldspars | 9.65 | 16.5 | 5.07 | 2.16 | 5.78 |
| Orthopyroxene | 14.8 | 19.7 | 9.11 | 6.08 | 23.7 |
| Clinopyroxene | 5.01 | 8.24 | 3.87 | 3.81 | 13.3 |
| Amphibole | 16.0 | 15.9 | 18.5 | 25.1 | 9.12 |
| Biotite/Phlogopite | 0.30 | 0.67 | 0.31 | 0.22 | 0.06 |
| Talc | 5.06 | 0.22 | 0.17 | 0.14 | 0.54 |
| Chlorite | 0.08 | 0.05 | 0.06 | 0.03 | 0.04 |
| Other Silicates | 0.34 | 0.11 | 0.05 | 0.03 | 0.10 |
| Carbonates | 1.07 | 0.90 | 0.89 | 1.11 | 0.60 |
| Oxides | 0.08 | 0.04 | 0.03 | 0.04 | 0.02 |
| Apatite | 0.05 | 0.02 | 0.13 | 0.11 | 0.02 |
| Other | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Upon review of the samples included within the study, there is no apparent non-sulphide mineral species that could impact mineral process performance in terms of reactive minerals that exhibit natural hydrophobic properties or alter pulp rheology with the exception of talc in D01618. The presence of sulphide gangue (pyrrhotite and pyrite) will be readily collected by reagents used to recover both pentlandite and chalcopyrite.

From a mineral processing perspective there are two main flowsheet options for recovery of Cu/Ni:

a) Full sequential flotation of copper followed by nickel

b) Bulk Cu/Ni flotation followed by separation

c) Or combination of sequential / bulk

Other specialty flowsheets which could be considered would include a hybrid of the above. Specific discussion follows in context of mineral texture.

**Rougher Performance Expectations**

To successfully produce selective copper and nickel concentrates understanding the degree of liberation and association of the non liberated particles of interest must be understood; this is a factor that is dependent on grind size distribution typically improving from coarse to fine sizes. The current mineralogy study was completed at a particle size of 90% passing 150 µm translating to approximately 135-145 µm on a $k_{80}$ basis. Association of copper and nickel minerals is provided by Table 22 and Table 23 respectively.

**Table 22: Copper Association**

| Mineral | Liberation/Associaton | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Chalcopyrite | Pure | 52.3 | 53.8 | 50.6 | 62.5 | 56.1 |
| | Free | 0.00 | 6.68 | 15.2 | 6.89 | 7.67 |
| | Liberated | 4.69 | 5.56 | 5.17 | 5.87 | 7.02 |
| | Pentlandite | 1.29 | 2.84 | 0.66 | 0.69 | 0.78 |
| | Pyrrhotite | 5.49 | 4.69 | 14.0 | 6.35 | 4.26 |
| | Pyrite | 12.3 | 5.08 | 2.15 | 8.61 | 8.60 |
| | Fe Sulphide:Pentlandite | 4.55 | 8.48 | 5.88 | 5.76 | 10.4 |
| | Hard Silicates | 3.70 | 6.95 | 2.03 | 0.88 | 1.52 |
| | Soft Silicates | 0.05 | 0.02 | 0.01 | 0.21 | 0.07 |
| | Carbonates | 0.02 | 0.05 | 0.00 | 0.01 | 0.02 |
| | Oxides | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| | Complex | 15.6 | 5.81 | 4.31 | 2.29 | 3.58 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | Liberated | 57.0 | 66.1 | 70.9 | 75.2 | 70.8 |
| | Expected Cu Recovery | 80.6 | 87.2 | 93.6 | 96.6 | 94.8 |

**Table 23: Nickel Association**

| Mineral | Liberation/Associaton | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Pentlandite | Pure | 52.3 | 53.3 | 59.0 | 66.0 | 58.3 |
| | Free | 26.0 | 18.1 | 21.2 | 17.6 | 21.2 |
| | Liberated | 8.07 | 12.2 | 8.59 | 8.19 | 8.78 |
| | Pyrrhotite | 9.75 | 8.15 | 8.83 | 6.09 | 6.99 |
| | Pyrite | 0.18 | 1.68 | 0.06 | 0.26 | 0.36 |
| | Chalcopyrite | 0.03 | 0.51 | 0.07 | 0.05 | 0.10 |
| | Chalcopyrite:Fe Sulphide | 0.93 | 3.60 | 0.74 | 0.47 | 2.57 |
| | Hard Silicates | 0.77 | 1.07 | 0.64 | 0.65 | 0.65 |
| | Soft Silicates | 0.06 | 0.01 | 0.02 | 0.00 | 0.03 |
| | Carbonates | 0.08 | 0.08 | 0.03 | 0.10 | 0.01 |
| | Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Complex | 1.82 | 1.38 | 0.79 | 0.62 | 1.01 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | Liberated | 86.4 | 83.5 | 88.8 | 91.8 | 88.3 |
| | Expected Ni Misplacement | 0.96 | 4.11 | 0.81 | 0.52 | 2.67 |

An opportunity to float a sequential copper followed by nickel depends on the degree of nickel associated copper, as outlined by Table 23 and highlighted under 'Expected Ni Misplacement' (Expected Ni Misplacement is deemed to be the pentlandite that is associated with chalcopyrite that would go to the copper concentrate and therefore lost to the nickel concentrate). This data suggests theoretical misplacement as low as 0.52% for sample D01621, and as high as 4.11% with D01619 material. In practice, nickel misplacement will likely be higher than theoretical values; however this suggests an independent copper concentrate can be produced.

Considering rougher performance, it should be expected to see rougher recoveries nearing 90% for both copper and nickel if selecting a primary grind of 140 microns or finer, which is comparable to similar projects of this mineralogical type.

**Cleaner Circuit Considerations**

Metallurgical factors that can be controlled in contributing an achievable saleable final concentrate specification in terms of copper or nickel levels are driven by:

- Regrinding of rougher concentrates to a required size that liberates both nickel and copper sulphides
- Controlling free floating gangue; both iron sulphides and non-sulphide
    - Consider control by dispersants and talc depressants (such as carboyxmethyl cellulose (CMC))

By considering mineral grain sizes for both chalcopyrite and pentlandite, regrind targets for either a bulk or sequential flowsheet can be recommended. Data highlighted in Table 24 suggest regrinding to ~25 microns is suitable for pentlandite but a finer regrind of between 10-20 microns is required for chalcopyrite.

**Table 24: Regrind Targets**

| | Composite Head Modal Mineral Grain Size (µm) | | | | |
|---|---|---|---|---|---|
| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
| Pentlandite | 23 | 22 | 23 | 24 | 23 |
| Chalcopyrite | 12 | 15 | 18 | 17 | 18 |
| Pyrrhotite | 24 | 27 | 28 | 23 | 25 |
| Pyrite | 20 | 18 | 19 | 33 | 14 |
| Quartz | 17 | 18 | 19 | 19 | 19 |
| Feldspars | 28 | 33 | 30 | 30 | 30 |
| Orthopyroxene | 17 | 24 | 17 | 12 | 26 |
| Clinopyroxene | 27 | 30 | 27 | 30 | 33 |
| Amphibole | 21 | 24 | 25 | 27 | 21 |
| Biotite/Phlogopite | 13 | 18 | 15 | 19 | 11 |
| Talc | 18 | 9 | 9 | 9 | 10 |
| Chlorite | 7 | 7 | 8 | 8 | 7 |
| Other Silicates | 7 | 6 | 6 | 6 | 6 |
| Carbonates | 11 | 11 | 12 | 13 | 11 |
| Oxides | 11 | 8 | 9 | 9 | 9 |
| Apatite | 20 | 9 | 26 | 22 | 11 |
| Other | 9 | 8 | 9 | 8 | 8 |

**Final Considerations**

The level of iron sulphides for all samples will need to be carefully monitored and steps must be taken to control mass recovery. Pyrrhotite content is high for all samples and carries the ability to intrinsically oxidize nickel sulphides diminishing recovery.

*Controlling mass recovery:*

- Iron sulphides: pH control with lime or soda ash
- Talc rejection: CMC type depressants, most effectively added within the cleaner circuits

*Pyrrhotite interference:*

- Pulp galvanic properties during grinding can negatively impact flotation both from an oxygen depletion/demand perspective and the oxidation of sulphides.

- Based on the mineralogical testwork there are no inherent obvious implications with the pentlandite/pyrrhotite ratios; this can be controllable during flotation but any possible issues cannot be identified until metallurgical testwork is carried out.

*Copper concentrate:*

- Apart from sample D01618 which is low grade (<0.5%) and doubtable, all of the other samples should be capable of achieving a final copper concentrate with a saleable grade; but this would have to be confirmed by metallurgical testing.

*Cobalt:*

- There are no implications for cobalt, unless it reaches a high level in the final nickel concentrate, where it can become a penalty element. This is an unknown until metallurgical testwork is carried out and nickel concentrates are produced.

# *Conclusions*

- Sulphides identified in the samples include pyrrhotite (27-50%), pentlandite (7-10%), pyrite (2-22%), and chalcopyrite (0.4-1.5%).

- Orthopyroxene, amphibole and feldspar are the major silicates, with minor clinopyroxene, and trace other minerals. Talc was noted as a minor mineral in sample D01618; this was confirmed by XRD analysis.

- The identification of talc within sample D01618 could have a potential impact on the recovery of the pentlandite through flotation because it will be recovered along with the sulphides due to its hydrophobic characteristics, unless it is managed. Trace amounts were found in the other samples, which could also have a potential impact, but note that this is a tentative identification; as it can be an alteration product of the pyroxenes and has similar chemistry.

- For the crushed samples, the grain size ($D_{50}$) for pentlandite ranges from 38 µm to 43 µm, for chalcopyrite it is 19 µm to 32 µm and iron sulphides (pyrite and pyrrhotite) it is 44 µm to 56 µm. The overall particle size is 48 µm to 55 µm.

- EMPA was used to determine the elemental composition of pyrrhotite, pentlandite, pyrite, chalcopyrite, orthopyroxene, amphibole, clinopyroxene, biotite, chlorite and talc, in order to define the deportment of nickel and cobalt.

- Using the QEMSCAN and EMPA data to evaluate nickel and cobalt deportment, pentlandite was found to carry over 90% of nickel and on average 70% of the cobalt in the samples (apart from sample D01621). Pyrrhotite also carries significant amounts of nickel with an average of 5.5% with pyrite carrying an average of 30% of the cobalt. Chalcopyrite carries 100% of the copper in the samples.

- Nickel is also found in trace amounts in the silicates; with only talc carrying >0.1% nickel at 0.12%.

- At 90% passing 150 µm, the majority of pentlandite (averaging 97%) is potentially recoverable to the rougher concentrate, with approximately 3% non-recoverable (lost to the rougher tails).

- Chalcopyrite also shows a high recovery to the rougher concentrate at an average of 89%, with approximately 11% of non-recoverable (lost to the rougher tails).

# *Appendix A – Certificate of Analysis*

SGS

# Certificate of Analysis
## Work Order : VC152849
## [Report File No.: 0000013337]

**Date:** October 27, 2015

**To:** **Met - Sarah Prout**
**F400101 SGS CANADA INC**
3260 PRODUCTION WAY
BURNABY BC V5A 4W4

**P.O. No.:** AMF/MI7011-OCT15
**Project No.:** CAVM-14021-103
**Samples:** 5
**Received:** Oct 22, 2015
**Pages:** Page 1 to 4
(Inclusive of Cover Sheet)

**Methods Summary**

| No. Of Samples | Method Code | Description |
|---|---|---|
| 5 | G_LOG02 | Pre-preparation processing, sorting, logging, boxing |
| 5 | GC_CSA06V | Total Sulfur, Leco Method |
| 5 | GO_XRF77B | Pyrosulphate fusion, XRF Base Metal package (0.2g) |
| 5 | GO_XRF76V | Ore grade Borate fusion, XRF |

Certified By : ____________________
Cam Chiang
Assistant Operations Manager

***SGS Minerals Services Geochemistry Vancouver conforms to the requirements of ISO/IEC 17025 for specific tests as listed on their scope of accreditation which can be found at http://www.scc.ca/en/search/palcan/sgs***

Report Footer:

L.N.R. = Listed not received
n.a. = Not applicable
I.S. = Insufficient Sample
-- = No result

*INF = Composition of this sample makes detection impossible by this method

*M* after a result denotes ppb to ppm conversion, % denotes ppm to % conversion

Methods marked with an asterisk (e.g. *NAA08V) were subcontracted
Elements marked with the @ symbol (e.g. @Cu) denote assays performed using accredited test methods

SGS



| Element | S | Co | Cu | Ni | @LOI | @SiO2 | @Al2O3 | @Fe2O3 |
|---|---|---|---|---|---|---|---|---|
| Method | GC_CSA06V | GO_XRF77B | GO_XRF77B | GO_XRF77B | GO_XRF76V | GO_XRF76V | GO_XRF76V | GO_XRF76V |
| Det.Lim. | 0.005 | 0.01 | 0.01 | 0.01 | -10.000 | 0.01 | 0.01 | 0.01 |
| Units | % | % | % | % | % | % | % | % |
| D 01618 | 18.2 | 0.08 | 0.15 | 3.41 | 7.54 | 29.1 | 4.39 | 39.3 |
| D 01619 | 14.2 | 0.08 | 0.32 | 2.89 | 5.58 | 34.4 | 6.04 | 33.2 |
| D 01620 | 23.9 | 0.13 | 0.18 | 3.58 | 9.15 | 21.2 | 2.90 | 50.3 |
| D 01621 | 27.6 | 0.21 | 0.34 | 2.83 | 13.6 | 19.8 | 2.23 | 48.3 |
| D 01622 | 18.1 | 0.11 | 0.44 | 3.93 | 6.66 | 28.5 | 3.01 | 40.3 |

SGS



| Element | @MgO | @CaO | @K2O | @Na2O | @TiO2 | @MnO | @P2O5 | @Cr2O3 |
|---|---|---|---|---|---|---|---|---|
| Method | GO_XRF76V | GO_XRF76V | GO_XRF76V | GO_XRF76V | GO_XRF76V | GO_XRF76V | GO_XRF76V | GO_XRF76V |
| Det.Lim. | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Units | % | % | % | % | % | % | % | % |
| D 01618 | 9.02 | 5.08 | 0.11 | 0.74 | 0.16 | 0.12 | 0.02 | 0.12 |
| D 01619 | 9.30 | 6.04 | 0.14 | 1.26 | 0.18 | 0.13 | 0.01 | 0.13 |
| D 01620 | 6.31 | 4.57 | 0.10 | 0.48 | 0.15 | 0.12 | 0.05 | 0.08 |
| D 01621 | 6.11 | 4.67 | 0.09 | 0.39 | 0.14 | 0.15 | 0.05 | 0.09 |
| D 01622 | 9.84 | 5.46 | 0.05 | 0.52 | 0.14 | 0.16 | <0.01 | 0.14 |

SGS



Final : VC152849 Order: AMF/MI7011-OCT15

Report File No.: 0000013337

| Element | @V2O5 | Sum |
|---|---|---|
| Method | GO_XRF76V | GO_XRF76V |
| Det.Lim. | 0.01 | 0 |
| Units | % | % |
| D 01618 | 0.02 | 95.6 |
| D 01619 | 0.01 | 96.4 |
| D 01620 | <0.01 | 95.4 |
| D 01621 | 0.01 | 95.7 |
| D 01622 | 0.02 | 94.8 |

# *Appendix B – XRD Analysis*

SGS

# Qualitative X-Ray Diffraction

| | |
|---|---|
| ***Report Prepared for:*** | *SGS Canada Inc* |
| ***Project Number/ LIMS No.*** | *14021-103/MI4521-OCT15* |
| ***Sample Receipt:*** | *October 27, 2015* |
| ***Sample Analysis:*** | *October 30, 2015* |
| ***Reporting Date:*** | *November 17, 2015* |

---

| | |
|---|---|
| ***Instrument:*** | BRUKER AXS D8 Advance Diffractometer |
| ***Test Conditions:*** | Co radiation, 40 kV, 35 mA<br>Regular Scanning: Step: 0.02°, Step time:0.2s, 2θ range: 3-70° |
| ***Interpretations***: | PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva software. |
| ***Detection Limit***: | 0.5-2%. Strongly dependent on crystallinity. |

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***Contents:***



Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

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Senior Mineralogist



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Member of the SGS Group (SGS SA)

## Method Summary

The Qualitative Mineral Identification By XRD (ME-LR-MIN-MET-MN-D01) method used by SGS Minerals Services is accredited to the requirements of ISO/IEC 17025.

***Mineral Identification and Interpretation:***

Mineral identification and interpretation involve matching the diffraction pattern of an unknown test sample to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) and released on software as a database of Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (Whole Rock Analysis, Inductively Coupled Plasma - Optical Emission Spectroscopy, etc.).

# Summary of Qualitative X-ray Diffraction Results

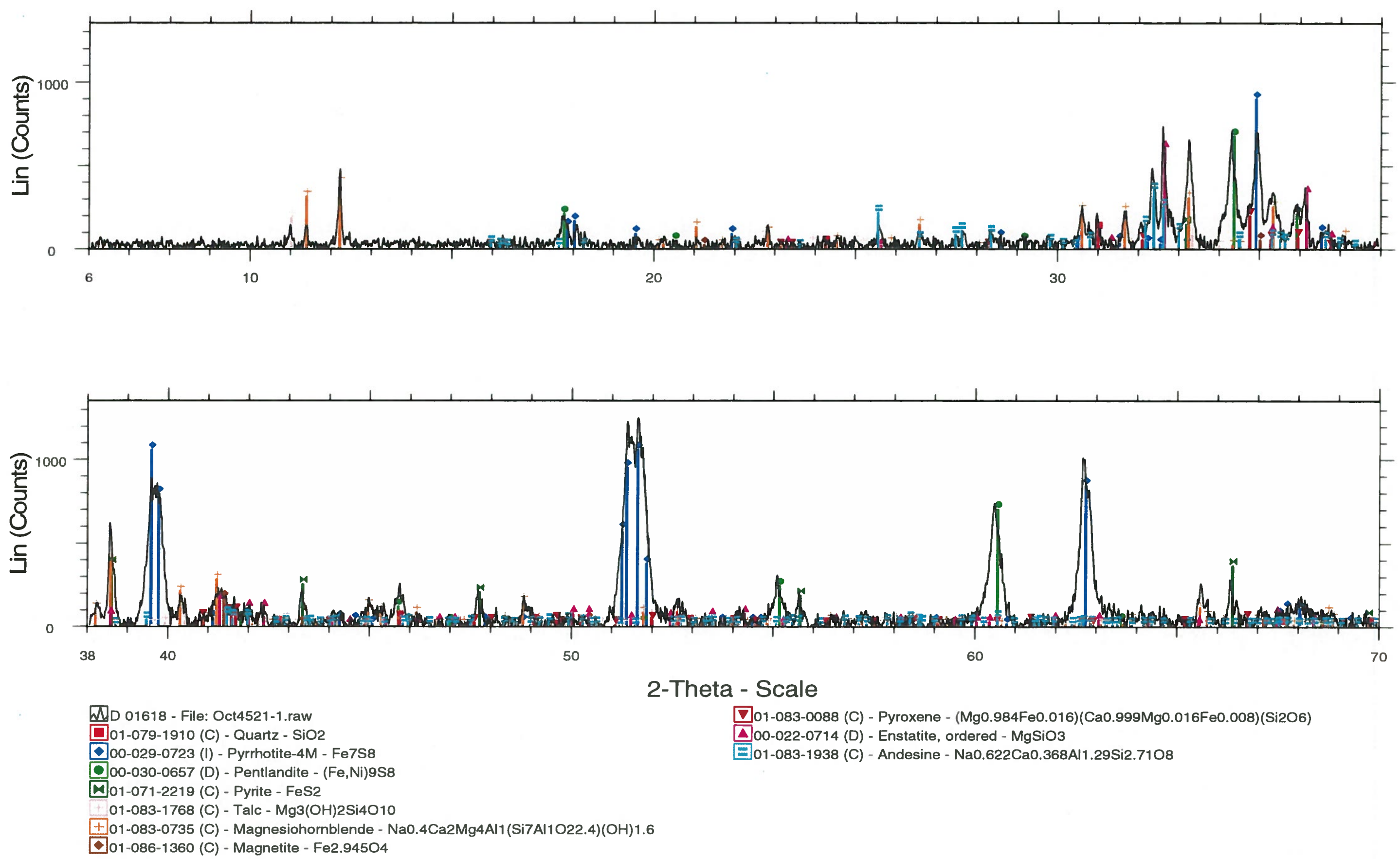
## *Crystalline Mineral Assemblage (relative proportions based on peak height)*

| Sample ID | Major | Moderate | Minor | Trace |
|---|---|---|---|---|
| *(1) D 01618* | pyrrhotite | pyroxene, pentlandite | pyrite, amphibole, plagioclase | *quartz, *talc, *magnetite |
| *(2) D 01622* | pyrrhotite | pentlandite pyroxene | amphibole, pyrite, plagioclase | *quartz, *magnetite |

** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity*

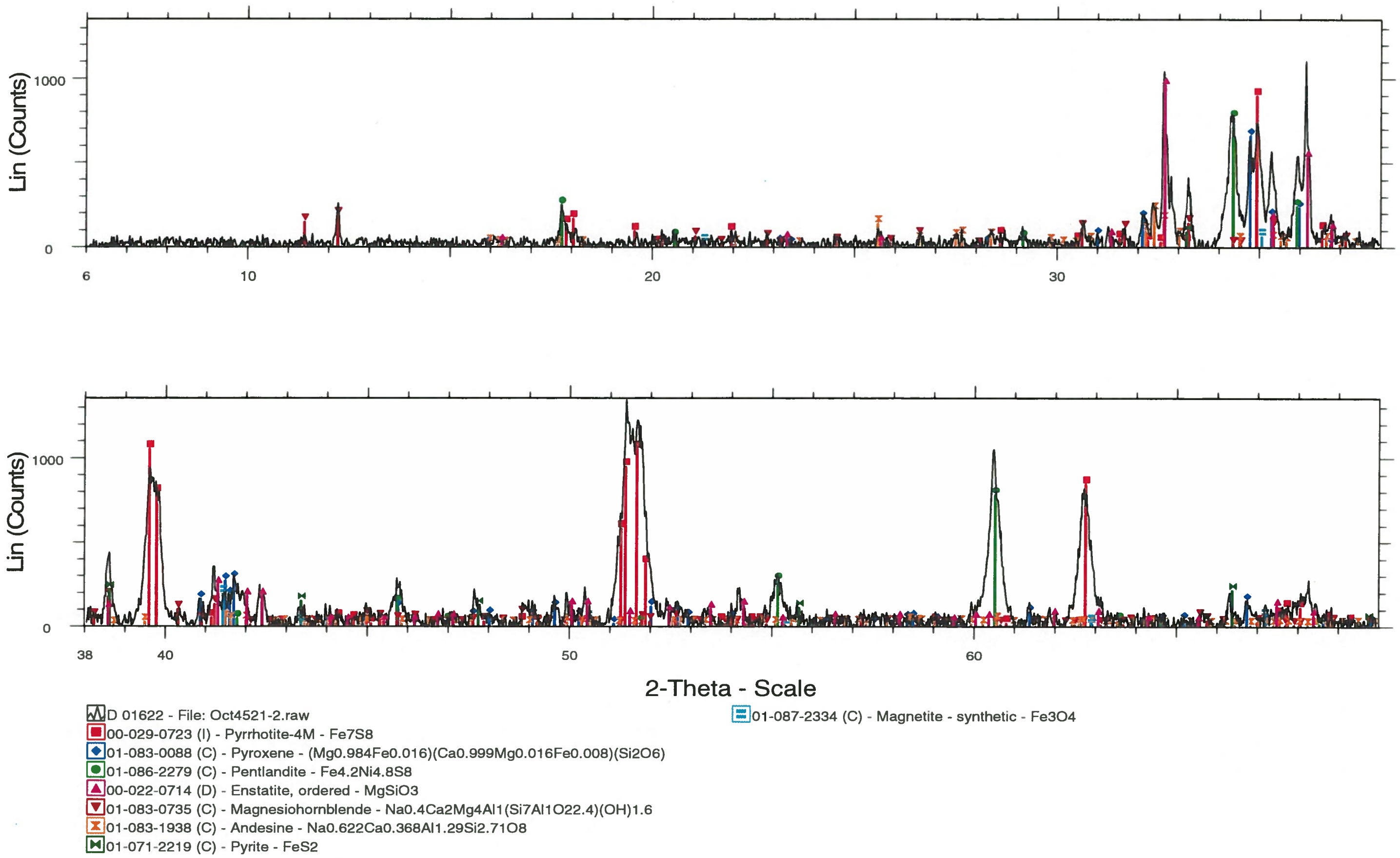
| Mineral | Composition |
|---|---|
| Amphibole | $(Na,K)Ca_2(Fe,Mg)_5(Al,Si)_8O_{22}(OH)_2$ |
| Magnetite | $Fe_3O_4$ |
| Pentlandite | $(Fe,Ni)_9S_8$ |
| Plagioclase | $(NaSi,CaAl)AlSi_2O_8$ |
| Pyrite | $FeS_2$ |
| Pyroxene | $(Ca,Na)(Mg,Fe,Al,Ti)(Si,Al)_2O_6$ |
| Pyrrhotite | $Fe_{(1-x)}S$ |
| Quartz | $SiO_2$ |

# D 01618


Lin (Counts)
1000
0
6
10
20
30
Lin (Counts)
1000
0
38
40
50
60
70
2-Theta - Scale
D 01618 - File: Oct4521-1.raw
01-079-1910 (C) - Quartz - SiO2
00-029-0723 (I) - Pyrrhotite-4M - Fe7S8
00-030-0657 (D) - Pentlandite - (Fe,Ni)9S8
01-071-2219 (C) - Pyrite - FeS2
01-083-1768 (C) - Talc - Mg3(OH)2Si4O10
01-083-0735 (C) - Magnesiohornblende - Na0.4Ca2Mg4Al1(Si7Al1O22.4)(OH)1.6
01-086-1360 (C) - Magnetite - Fe2.945O4
01-083-0088 (C) - Pyroxene - (Mg0.984Fe0.016)(Ca0.999Mg0.016Fe0.008)(Si2O6)
00-022-0714 (D) - Enstatite, ordered - MgSiO3
01-083-1938 (C) - Andesine - Na0.622Ca0.368Al1.29Si2.71O8

SGS Canada Inc
14021-103/MI4521-OCT15
17-Nov-15

# D 01622



# *Appendix C – EMPA Data*

CAVM-14021-103
North American Nickel

Sulphides

| Sample Name | PS | Mineral | As | Ni | S | Fe | Co | Cu | Zn | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Chalcopyrite | 0.00 | 0.00 | 35.2 | 30.1 | 0.00 | 34.4 | 0.06 | 99.72 |
| D 01618 | 12B | Chalcopyrite | 0.02 | 0.00 | 34.9 | 30.2 | 0.02 | 34.5 | 0.01 | 99.67 |
| D 01618 | 12B | Chalcopyrite | 0.09 | 0.03 | 35.1 | 30.2 | 0.00 | 34.4 | 0.02 | 99.84 |
| D 01618 | 12B | Chalcopyrite | 0.00 | 0.00 | 35.2 | 29.3 | 0.02 | 34.6 | 0.04 | 99.22 |
| D 01619 | 22B | Chalcopyrite | 0.00 | 0.00 | 35.0 | 30.6 | 0.00 | 35.1 | 0.05 | 100.74 |
| D 01619 | 22B | Chalcopyrite | 0.00 | 0.00 | 35.2 | 30.1 | 0.00 | 34.7 | 0.04 | 100.05 |
| D 01620 | 32B | Chalcopyrite | 0.04 | 0.00 | 35.1 | 30.4 | 0.01 | 35.2 | 0.03 | 100.78 |
| D 01620 | 32B | Chalcopyrite | 0.00 | 0.04 | 34.9 | 29.8 | 0.00 | 34.5 | 0.01 | 99.22 |
| D 01620 | 32B | Chalcopyrite | 0.00 | 0.01 | 35.0 | 30.4 | 0.00 | 34.9 | 0.05 | 100.36 |
| D 01620 | 32B | Chalcopyrite | 0.00 | 0.01 | 35.2 | 30.2 | 0.00 | 35.0 | 0.04 | 100.42 |
| D 01620 | 32B | Chalcopyrite | 0.00 | 0.02 | 35.2 | 30.2 | 0.00 | 35.0 | 0.06 | 100.44 |
| D 01621 | 42B | Chalcopyrite | 0.00 | 0.02 | 35.2 | 30.4 | 0.01 | 35.0 | 0.04 | 100.70 |
| D 01621 | 42B | Chalcopyrite | 0.06 | 0.03 | 35.4 | 29.9 | 0.00 | 35.3 | 0.02 | 100.64 |
| | 52B | Chalcopyrite | 0.00 | 0.00 | 35.2 | 30.5 | 0.00 | 34.8 | 0.02 | 100.47 |
| | 52B | Chalcopyrite | 0.01 | 0.02 | 35.2 | 30.3 | 0.00 | 34.8 | 0.04 | 100.34 |
| | 52B | Chalcopyrite | 0.00 | 0.00 | 34.9 | 30.2 | 0.01 | 34.8 | 0.07 | 99.97 |
| | 52B | Chalcopyrite | 0.05 | 0.04 | 35.1 | 30.0 | 0.01 | 34.5 | 0.05 | 99.77 |
| | Chalcopyrite | ***Average*** | ***<DL*** | ***<DL*** | ***35.1*** | ***30.2*** | ***<DL*** | ***34.8*** | ***<DL*** | |
| | | *SD* | | | *0.13* | *0.29* | | *0.27* | | |
| | | *Min* | *0.00* | *0.00* | *34.9* | *29.3* | *0.00* | *34.4* | *0.01* | |
| | | *Max* | *0.09* | *0.04* | *35.4* | *30.6* | *0.02* | *35.3* | *0.07* | |
| | | ***n*** | ***17*** | | | | | | | |

| Sample Name | PS | Mineral | As | Ni | S | Fe | Co | Cu | Zn | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Pentlandite | 0.01 | 36.4 | 33.3 | 29.6 | 0.73 | 0.04 | 0.00 | 100.10 |
| D 01618 | 12B | Pentlandite | 0.04 | 36.1 | 33.0 | 29.6 | 0.77 | 0.05 | 0.00 | 99.53 |
| D 01618 | 12B | Pentlandite | 0.01 | 36.1 | 33.3 | 29.6 | 0.72 | 0.06 | 0.00 | 99.69 |
| D 01618 | 12B | Pentlandite | 0.00 | 36.0 | 33.0 | 29.3 | 0.68 | 0.01 | 0.00 | 99.01 |
| D 01618 | 12B | Pentlandite | 0.00 | 36.4 | 33.1 | 29.5 | 0.66 | 0.04 | 0.00 | 99.71 |
| D 01619 | 22B | Pentlandite | 0.00 | 36.2 | 33.2 | 29.7 | 0.73 | 0.04 | 0.00 | 99.81 |
| D 01619 | 22B | Pentlandite | 0.03 | 36.1 | 33.2 | 29.6 | 0.72 | 0.04 | 0.00 | 99.74 |
| D 01619 | 22B | Pentlandite | 0.00 | 36.2 | 33.2 | 29.8 | 0.73 | 0.02 | 0.02 | 99.92 |
| D 01619 | 22B | Pentlandite | 0.00 | 36.4 | 33.1 | 29.0 | 0.73 | 0.06 | 0.00 | 99.23 |
| D 01619 | 22B | Pentlandite | 0.00 | 36.1 | 33.2 | 29.5 | 0.78 | 0.04 | 0.01 | 99.67 |
| D 01619 | 22B | Pentlandite | 0.08 | 36.3 | 33.3 | 29.4 | 0.75 | 0.04 | 0.00 | 99.91 |
| D 01620 | 32B | Pentlandite | 0.00 | 36.3 | 33.6 | 30.0 | 1.06 | 0.02 | 0.00 | 101.02 |
| D 01620 | 32B | Pentlandite | 0.00 | 35.5 | 33.3 | 29.6 | 1.09 | 0.05 | 0.00 | 99.49 |
| D 01620 | 32B | Pentlandite | 0.05 | 35.1 | 33.2 | 30.0 | 1.11 | 0.01 | 0.00 | 99.48 |
| D 01620 | 32B | Pentlandite | 0.01 | 35.3 | 33.2 | 29.7 | 1.09 | 0.02 | 0.01 | 99.32 |
| D 01620 | 32B | Pentlandite | 0.02 | 35.6 | 33.3 | 29.4 | 1.09 | 0.04 | 0.00 | 99.41 |
| D 01620 | 32B | Pentlandite | 0.00 | 35.5 | 33.3 | 29.9 | 1.09 | 0.02 | 0.00 | 99.84 |
| D 01621 | 42B | Pentlandite | 0.00 | 36.1 | 33.3 | 29.1 | 1.28 | 0.02 | 0.00 | 99.81 |
| D 01621 | 42B | Pentlandite | 0.06 | 36.2 | 33.2 | 29.2 | 1.05 | 0.03 | 0.00 | 99.72 |
| D 01621 | 42B | Pentlandite | 0.01 | 35.7 | 33.4 | 29.4 | 1.22 | 0.03 | 0.00 | 99.65 |
| D 01621 | 42B | Pentlandite | 0.02 | 35.9 | 33.2 | 29.7 | 1.16 | 0.00 | 0.00 | 99.98 |
| D 01621 | 42B | Pentlandite | 0.00 | 35.3 | 33.1 | 29.2 | 1.23 | 0.02 | 0.00 | 98.76 |
| D 01622 | 52B | Pentlandite | 0.06 | 35.6 | 33.3 | 29.8 | 0.86 | 0.04 | 0.01 | 99.69 |
| D 01622 | 52B | Pentlandite | 0.00 | 36.1 | 33.5 | 30.0 | 0.92 | 0.04 | 0.00 | 100.52 |
| D 01622 | 52B | Pentlandite | 0.00 | 35.4 | 33.0 | 29.3 | 0.88 | 0.02 | 0.00 | 98.66 |
| D 01622 | 52B | Pentlandite | 0.01 | 35.6 | 33.3 | 30.1 | 0.79 | 0.02 | 0.00 | 99.76 |
| D 01622 | 52B | Pentlandite | 0.08 | 36.1 | 33.1 | 29.7 | 0.79 | 0.02 | 0.01 | 99.81 |
| D 01622 | 52B | Pentlandite | 0.08 | 35.2 | 33.5 | 30.1 | 0.90 | 0.03 | 0.00 | 99.85 |
| | Pentlandite | ***Average*** | ***<DL*** | ***35.9*** | ***33.2*** | ***29.6*** | ***0.91*** | ***<DL*** | ***<DL*** | |
| | | *SD* | | *0.40* | *0.15* | *0.30* | *0.19* | | | |
| | | *Min* | *0.00* | *35.1* | *33.0* | *29.0* | *0.66* | *0.00* | *0.00* | |
| | | *Max* | *0.08* | *36.4* | *33.6* | *30.1* | *1.28* | *0.06* | *0.02* | |
| | | ***n*** | ***28*** | | | | | | | |

| Sample Name | PS | Mineral | As | Ni | S | Fe | Co | Cu | Zn | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Pyrite | 0.00 | 0.03 | 53.4 | 46.1 | 0.62 | 0.00 | 0.00 | 100.23 |
| D 01618 | 12B | Pyrite | 0.01 | 0.05 | 53.8 | 46.0 | 0.48 | 0.00 | 0.00 | 100.31 |
| D 01618 | 12B | Pyrite | 0.00 | 0.00 | 53.4 | 46.2 | 0.47 | 0.00 | 0.00 | 100.06 |
| D 01618 | 12B | Pyrite | 0.00 | 0.01 | 53.4 | 46.1 | 0.54 | 0.00 | 0.00 | 100.04 |
| D 01618 | 12B | Pyrite | 0.00 | 0.04 | 53.2 | 46.3 | 0.49 | 0.00 | 0.00 | 100.02 |
| D 01619 | 22B | Pyrite | 0.03 | 0.03 | 53.2 | 46.5 | 0.57 | 0.00 | 0.00 | 100.25 |
| D 01619 | 22B | Pyrite | 0.07 | 0.03 | 53.6 | 46.3 | 0.52 | 0.00 | 0.00 | 100.51 |
| D 01619 | 22B | Pyrite | 0.02 | 0.07 | 53.5 | 46.0 | 0.71 | 0.00 | 0.00 | 100.23 |
| D 01619 | 22B | Pyrite | 0.00 | 0.02 | 53.5 | 44.4 | 2.51 | 0.01 | 0.00 | 100.37 |
| D 01619 | 22B | Pyrite | 0.00 | 0.01 | 53.5 | 46.2 | 0.62 | 0.01 | 0.00 | 100.24 |
| D 01619 | 22B | Pyrite | 0.01 | 0.05 | 53.7 | 46.2 | 0.55 | 0.00 | 0.00 | 100.51 |
| D 01619 | 22B | Pyrite | 0.00 | 0.02 | 53.2 | 44.4 | 2.23 | 0.00 | 0.00 | 99.83 |
| D 01620 | 32B | Pyrite | 0.00 | 0.05 | 53.4 | 46.4 | 0.45 | 0.00 | 0.00 | 100.33 |
| D 01620 | 32B | Pyrite | 0.00 | 0.04 | 53.2 | 46.4 | 0.50 | 0.00 | 0.00 | 100.16 |
| D 01620 | 32B | Pyrite | 0.00 | 0.03 | 53.7 | 46.6 | 0.33 | 0.00 | 0.01 | 100.64 |
| D 01620 | 32B | Pyrite | 0.00 | 0.03 | 53.5 | 46.4 | 0.42 | 0.00 | 0.00 | 100.31 |
| D 01620 | 32B | Pyrite | 0.01 | 0.04 | 53.3 | 46.1 | 0.48 | 0.00 | 0.00 | 99.93 |
| D 01621 | 42B | Pyrite | 0.02 | 0.00 | 53.6 | 46.0 | 0.55 | 0.00 | 0.00 | 100.16 |
| D 01621 | 42B | Pyrite | 0.00 | 0.01 | 53.7 | 46.3 | 0.69 | 0.00 | 0.00 | 100.71 |
| D 01621 | 42B | Pyrite | 0.00 | 0.04 | 53.5 | 46.3 | 0.59 | 0.00 | 0.01 | 100.40 |
| D 01621 | 42B | Pyrite | 0.00 | 0.01 | 53.7 | 46.3 | 0.60 | 0.00 | 0.00 | 100.53 |
| D 01621 | 42B | Pyrite | 0.00 | 0.04 | 53.5 | 46.3 | 0.41 | 0.00 | 0.00 | 100.19 |
| D 01622 | 52B | Pyrite | 0.02 | 0.03 | 53.5 | 45.2 | 1.61 | 0.01 | 0.00 | 100.35 |
| D 01622 | 52B | Pyrite | 0.03 | 0.03 | 53.4 | 44.7 | 1.49 | 0.00 | 0.00 | 99.71 |
| D 01622 | 52B | Pyrite | 0.03 | 0.02 | 53.5 | 45.4 | 1.39 | 0.00 | 0.00 | 100.32 |
| D 01622 | 52B | Pyrite | 0.00 | 0.00 | 53.5 | 45.6 | 0.91 | 0.00 | 0.00 | 99.98 |
| D 01622 | 52B | Pyrite | 0.00 | 0.02 | 53.5 | 45.9 | 0.65 | 0.01 | 0.00 | 100.03 |
| D 01622 | 52B | Pyrite | 0.00 | 0.02 | 53.4 | 45.8 | 0.66 | 0.01 | 0.00 | 99.88 |
| | Pyrite | ***Average*** | ***<DL*** | ***<DL*** | ***53.5*** | ***45.9*** | ***0.79*** | ***<DL*** | ***<DL*** | |
| | | *SD* | | | *0.16* | *0.60* | *0.55* | | | |
| | | *Min* | *0.00* | *0.00* | *53.2* | *44.4* | *0.33* | *0.00* | *0.00* | |
| | | *Max* | *0.07* | *0.07* | *53.8* | *46.6* | *2.51* | *0.01* | *0.01* | |
| | | ***n*** | ***28*** | | | | | | | |

| Sample Name | PS | Mineral | As | Ni | S | Fe | Co | Cu | Zn | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Pyrrhotite | 0.00 | 0.41 | 39.5 | 60.1 | 0.01 | 0.00 | 0.00 | 99.98 |
| D 01618 | 12B | Pyrrhotite | 0.03 | 0.52 | 39.5 | 60.1 | 0.00 | 0.00 | 0.00 | 100.10 |
| D 01618 | 12B | Pyrrhotite | 0.01 | 0.44 | 39.6 | 60.2 | 0.01 | 0.00 | 0.01 | 100.21 |
| D 01618 | 12B | Pyrrhotite | 0.03 | 0.46 | 39.3 | 60.1 | 0.01 | 0.00 | 0.00 | 99.95 |
| D 01618 | 12B | Pyrrhotite | 0.00 | 0.50 | 39.3 | 59.9 | 0.03 | 0.00 | 0.01 | 99.72 |
| D 01619 | 22B | Pyrrhotite | 0.00 | 0.65 | 39.3 | 60.1 | 0.01 | 0.00 | 0.01 | 100.01 |
| D 01619 | 22B | Pyrrhotite | 0.00 | 0.44 | 39.5 | 60.3 | 0.00 | 0.00 | 0.00 | 100.18 |
| D 01619 | 22B | Pyrrhotite | 0.02 | 0.71 | 39.4 | 59.7 | 0.00 | 0.00 | 0.02 | 99.80 |
| D 01619 | 22B | Pyrrhotite | 0.00 | 0.58 | 39.6 | 60.0 | 0.00 | 0.00 | 0.01 | 100.18 |
| D 01619 | 22B | Pyrrhotite | 0.00 | 0.67 | 39.3 | 60.1 | 0.00 | 0.00 | 0.00 | 100.11 |
| D 01619 | 22B | Pyrrhotite | 0.02 | 0.65 | 39.5 | 60.2 | 0.00 | 0.00 | 0.00 | 100.33 |
| D 01620 | 32B | Pyrrhotite | 0.00 | 0.29 | 39.1 | 60.1 | 0.00 | 0.01 | 0.00 | 99.43 |
| D 01620 | 32B | Pyrrhotite | 0.00 | 0.29 | 39.4 | 60.1 | 0.02 | 0.00 | 0.00 | 99.84 |
| D 01620 | 32B | Pyrrhotite | 0.01 | 0.50 | 39.1 | 59.8 | 0.01 | 0.00 | 0.01 | 99.48 |
| D 01620 | 32B | Pyrrhotite | 0.00 | 0.49 | 39.2 | 60.3 | 0.01 | 0.00 | 0.00 | 100.05 |
| D 01620 | 32B | Pyrrhotite | 0.04 | 0.34 | 39.6 | 60.4 | 0.00 | 0.00 | 0.01 | 100.38 |
| D 01620 | 32B | Pyrrhotite | 0.00 | 0.47 | 39.2 | 60.3 | 0.02 | 0.00 | 0.02 | 100.00 |
| D 01621 | 42B | Pyrrhotite | 0.01 | 0.58 | 39.4 | 60.2 | 0.00 | 0.00 | 0.00 | 100.11 |
| D 01621 | 42B | Pyrrhotite | 0.00 | 0.45 | 39.6 | 60.5 | 0.01 | 0.00 | 0.00 | 100.51 |
| D 01621 | 42B | Pyrrhotite | 0.05 | 0.57 | 39.5 | 60.2 | 0.00 | 0.00 | 0.00 | 100.26 |
| D 01621 | 42B | Pyrrhotite | 0.00 | 0.65 | 39.6 | 59.8 | 0.01 | 0.00 | 0.00 | 100.00 |
| D 01621 | 42B | Pyrrhotite | 0.00 | 0.50 | 39.6 | 60.1 | 0.03 | 0.00 | 0.01 | 100.25 |
| D 01621 | 42B | Pyrrhotite | 0.00 | 0.66 | 39.4 | 59.8 | 0.00 | 0.00 | 0.00 | 99.76 |
| D 01622 | 52B | Pyrrhotite | 0.02 | 0.50 | 39.3 | 60.1 | 0.01 | 0.00 | 0.00 | 99.92 |
| D 01622 | 52B | Pyrrhotite | 0.00 | 0.38 | 39.4 | 60.1 | 0.00 | 0.00 | 0.00 | 99.94 |
| D 01622 | 52B | Pyrrhotite | 0.00 | 0.40 | 39.5 | 59.9 | 0.00 | 0.00 | 0.00 | 99.75 |
| D 01622 | 52B | Pyrrhotite | 0.00 | 0.57 | 39.4 | 60.0 | 0.00 | 0.00 | 0.00 | 99.95 |
| D 01622 | 52B | Pyrrhotite | 0.00 | 0.48 | 39.4 | 60.1 | 0.01 | 0.00 | 0.00 | 100.00 |
| D 01622 | 52B | Pyrrhotite | 0.00 | 0.65 | 39.4 | 60.1 | 0.00 | 0.00 | 0.01 | 100.14 |
| | Pyrrhotite | ***Average*** | ***<DL*** | ***0.51*** | ***39.4*** | ***60.1*** | ***<DL*** | ***<DL*** | ***<DL*** | |
| | | *SD* | | *0.11* | *0.14* | *0.18* | | | | |
| | | *Min* | *0.00* | *0.29* | *39.1* | *59.7* | *0.00* | *0.00* | *0.00* | |
| | | *Max* | *0.05* | *0.71* | *39.6* | *60.5* | *0.03* | *0.01* | *0.02* | |
| | | ***n*** | ***29*** | | | | | | | |

CAVM-14021-103
North American Nickel

Silicates

| Sample | PS | Mineral | Na | Mg | K | Ni | Si | Al | Ca | Fe | Ti | Mn | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Amphibole | 0.25 | 9.87 | 0.33 | 0.06 | 22.89 | 3.74 | 8.88 | 7.19 | 0.69 | 0.08 | 0.44 |
| D 01618 | 12B | Amphibole | 0.41 | 9.13 | 0.91 | 0.07 | 21.35 | 5.24 | 8.62 | 7.37 | 1.24 | 0.06 | 0.50 |
| D 01618 | 12B | Amphibole | 0.36 | 10.21 | 0.61 | 0.05 | 22.13 | 4.94 | 8.62 | 5.84 | 0.80 | 0.10 | 0.45 |
| D 01618 | 12B | Amphibole | 0.42 | 9.64 | 0.92 | 0.06 | 21.17 | 5.56 | 8.68 | 6.31 | 1.05 | 0.09 | 0.49 |
| D 01618 | 12B | Amphibole | 0.39 | 9.51 | 0.82 | 0.06 | 21.18 | 5.67 | 8.61 | 6.70 | 1.08 | 0.09 | 0.43 |
| D 01618 | 12B | Amphibole | 0.04 | 13.34 | 0.03 | 0.05 | 26.31 | 0.77 | 8.85 | 3.58 | 0.04 | 0.11 | 0.07 |
| D 01618 | 12B | Amphibole | 0.06 | 13.13 | 0.07 | 0.06 | 26.04 | 0.98 | 8.85 | 3.79 | 0.11 | 0.12 | 0.11 |
| D 01618 | 12B | Amphibole | 0.04 | 13.43 | 0.03 | 0.05 | 26.43 | 0.69 | 8.77 | 3.53 | 0.05 | 0.12 | 0.05 |
| D 01618 | 12B | Amphibole | 0.03 | 13.58 | 0.03 | 0.06 | 26.31 | 0.69 | 8.36 | 3.90 | 0.05 | 0.14 | 0.09 |
| D 01618 | 12B | Amphibole | 0.07 | 13.01 | 0.06 | 0.05 | 25.93 | 1.27 | 9.04 | 3.62 | 0.08 | 0.09 | 0.10 |
| D 01619 | 22B | Amphibole | 0.41 | 9.34 | 0.83 | 0.07 | 21.37 | 4.95 | 8.66 | 7.37 | 1.11 | 0.08 | 0.49 |
| D 01619 | 22B | Amphibole | 0.39 | 9.61 | 0.91 | 0.08 | 21.49 | 4.82 | 8.66 | 6.97 | 0.96 | 0.06 | 0.61 |
| D 01619 | 22B | Amphibole | 0.39 | 9.93 | 0.76 | 0.06 | 21.91 | 4.67 | 8.50 | 6.82 | 0.93 | 0.10 | 0.41 |
| D 01619 | 22B | Amphibole | 0.47 | 8.94 | 0.98 | 0.07 | 20.83 | 5.42 | 8.52 | 7.62 | 1.40 | 0.08 | 0.44 |
| D 01619 | 22B | Amphibole | 0.42 | 8.92 | 1.03 | 0.06 | 21.03 | 5.60 | 8.67 | 7.47 | 0.98 | 0.08 | 0.46 |
| D 01619 | 22B | Amphibole | 0.45 | 9.12 | 1.01 | 0.07 | 20.84 | 5.43 | 8.57 | 7.57 | 1.19 | 0.07 | 0.52 |
| D 01619 | 22B | Amphibole | 0.06 | 12.47 | 0.07 | 0.05 | 25.64 | 1.23 | 9.03 | 4.79 | 0.12 | 0.08 | 0.22 |
| D 01619 | 22B | Amphibole | 0.03 | 13.26 | 0.04 | 0.07 | 26.36 | 0.54 | 8.81 | 4.19 | 0.06 | 0.11 | 0.06 |
| D 01620 | 32B | Amphibole | 0.42 | 9.48 | 0.45 | 0.05 | 22.24 | 4.45 | 8.34 | 8.22 | 0.45 | 0.21 | 0.20 |
| D 01620 | 32B | Amphibole | 0.37 | 10.05 | 0.31 | 0.05 | 22.85 | 3.97 | 8.30 | 7.80 | 0.32 | 0.21 | 0.16 |
| D 01620 | 32B | Amphibole | 0.46 | 9.23 | 0.45 | 0.04 | 21.89 | 5.05 | 8.28 | 8.17 | 0.42 | 0.22 | 0.22 |
| D 01620 | 32B | Amphibole | 0.43 | 9.62 | 0.39 | 0.04 | 22.21 | 4.73 | 8.24 | 7.98 | 0.42 | 0.20 | 0.18 |
| D 01620 | 32B | Amphibole | 0.40 | 9.91 | 0.37 | 0.06 | 22.53 | 4.12 | 8.38 | 7.82 | 0.44 | 0.21 | 0.20 |
| D 01620 | 32B | Amphibole | 0.45 | 9.38 | 0.48 | 0.06 | 21.99 | 4.58 | 8.26 | 8.56 | 0.47 | 0.22 | 0.23 |
| D 01620 | 32B | Amphibole | 0.08 | 12.37 | 0.05 | 0.06 | 25.94 | 0.81 | 8.64 | 5.42 | 0.06 | 0.24 | 0.04 |
| D 01620 | 32B | Amphibole | 0.12 | 11.42 | 0.07 | 0.05 | 25.11 | 1.59 | 8.92 | 6.28 | 0.08 | 0.18 | 0.06 |
| D 01620 | 32B | Amphibole | 0.25 | 10.93 | 0.19 | 0.07 | 24.03 | 2.66 | 8.30 | 7.16 | 0.22 | 0.24 | 0.15 |
| D 01620 | 32B | Amphibole | 0.09 | 12.25 | 0.05 | 0.06 | 25.58 | 1.18 | 8.50 | 5.51 | 0.06 | 0.23 | 0.03 |
| D 01620 | 32B | Amphibole | 0.11 | 12.15 | 0.05 | 0.05 | 25.38 | 1.30 | 8.30 | 5.84 | 0.08 | 0.25 | 0.08 |
| D 01620 | 32B | Amphibole | 0.25 | 10.95 | 0.19 | 0.05 | 24.00 | 2.74 | 8.34 | 6.77 | 0.24 | 0.23 | 0.16 |
| D 01621 | 42B | Amphibole | 0.28 | 10.16 | 0.45 | 0.05 | 22.99 | 3.91 | 8.81 | 7.00 | 0.45 | 0.13 | 0.23 |
| D 01621 | 42B | Amphibole | 0.40 | 9.78 | 0.63 | 0.06 | 22.03 | 4.61 | 8.54 | 7.15 | 0.80 | 0.13 | 0.29 |
| D 01621 | 42B | Amphibole | 0.33 | 10.05 | 0.44 | 0.05 | 22.83 | 4.21 | 8.56 | 7.04 | 0.48 | 0.11 | 0.21 |
| D 01621 | 42B | Amphibole | 0.38 | 9.93 | 0.52 | 0.05 | 22.31 | 4.70 | 8.51 | 6.99 | 0.58 | 0.12 | 0.25 |
| D 01621 | 42B | Amphibole | 0.40 | 9.82 | 0.67 | 0.06 | 21.93 | 4.75 | 8.54 | 7.04 | 0.74 | 0.13 | 0.30 |
| D 01621 | 42B | Amphibole | 0.40 | 9.97 | 0.58 | 0.05 | 22.06 | 4.83 | 8.44 | 6.84 | 0.67 | 0.15 | 0.23 |
| D 01621 | 42B | Amphibole | 0.39 | 9.88 | 0.60 | 0.05 | 22.06 | 4.79 | 8.58 | 7.03 | 0.60 | 0.12 | 0.24 |
| D 01621 | 42B | Amphibole | 0.06 | 13.03 | 0.04 | 0.06 | 26.10 | 0.85 | 8.69 | 4.36 | 0.07 | 0.16 | 0.03 |
| D 01621 | 42B | Amphibole | 0.08 | 12.54 | 0.05 | 0.05 | 25.88 | 1.11 | 8.89 | 5.03 | 0.12 | 0.15 | 0.09 |
| D 01621 | 42B | Amphibole | 0.10 | 12.21 | 0.08 | 0.05 | 25.42 | 1.33 | 8.86 | 5.08 | 0.12 | 0.14 | 0.15 |
| D 01621 | 42B | Amphibole | 0.18 | 11.50 | 0.20 | 0.08 | 24.50 | 2.29 | 8.67 | 5.69 | 0.27 | 0.15 | 0.19 |
| D 01621 | 42B | Amphibole | 0.06 | 12.88 | 0.06 | 0.05 | 26.12 | 0.81 | 8.60 | 4.67 | 0.06 | 0.18 | 0.03 |
| D 01621 | 42B | Amphibole | 0.15 | 12.02 | 0.11 | 0.05 | 25.03 | 2.01 | 8.55 | 5.23 | 0.13 | 0.16 | 0.07 |
| D 01622 | 52B | Amphibole | 0.60 | 9.64 | 0.73 | 0.07 | 21.12 | 5.66 | 8.55 | 5.96 | 1.23 | 0.07 | 0.56 |
| D 01622 | 52B | Amphibole | 0.54 | 9.53 | 0.69 | 0.05 | 20.81 | 5.64 | 8.56 | 6.57 | 1.04 | 0.09 | 0.51 |
| D 01622 | 52B | Amphibole | 0.54 | 9.61 | 0.72 | 0.05 | 21.09 | 5.70 | 8.54 | 6.38 | 1.03 | 0.10 | 0.52 |
| D 01622 | 52B | Amphibole | 0.48 | 9.48 | 0.68 | 0.07 | 21.32 | 5.26 | 8.72 | 7.25 | 0.93 | 0.08 | 0.52 |
| D 01622 | 52B | Amphibole | 0.55 | 9.45 | 0.80 | 0.06 | 20.73 | 5.95 | 8.61 | 6.60 | 1.08 | 0.10 | 0.56 |
| D 01622 | 52B | Amphibole | 0.57 | 9.00 | 0.86 | 0.07 | 20.34 | 6.35 | 8.55 | 7.32 | 1.11 | 0.09 | 0.56 |
| D 01622 | 52B | Amphibole | 0.56 | 9.45 | 0.71 | 0.06 | 20.93 | 5.74 | 8.59 | 6.64 | 1.05 | 0.09 | 0.52 |
| D 01622 | 52B | Amphibole | 0.07 | 13.29 | 0.03 | 0.06 | 26.04 | 0.87 | 8.89 | 3.58 | 0.08 | 0.12 | 0.09 |
| D 01622 | 52B | Amphibole | 0.05 | 13.18 | 0.03 | 0.03 | 26.36 | 0.69 | 9.01 | 3.53 | 0.07 | 0.09 | 0.14 |
| D 01622 | 52B | Amphibole | 0.13 | 11.99 | 0.02 | 0.05 | 25.19 | 1.73 | 8.84 | 5.19 | 0.19 | 0.10 | 0.26 |
| D 01622 | 52B | Amphibole | 0.19 | 11.96 | 0.17 | 0.08 | 24.67 | 2.53 | 8.77 | 4.94 | 0.04 | 0.10 | 0.05 |
|  | Amphibole | ***Average*** | ***0.29*** | ***10.82*** | ***0.41*** | ***0.06*** | ***23.35*** | ***3.44*** | ***8.62*** | ***6.17*** | ***0.52*** | ***0.13*** | ***0.26*** |
|  |  | *SD* | *0.18* | *1.54* | *0.34* | *0.01* | *2.07* | *1.94* | *0.21* | *1.42* | *0.43* | *0.05* | *0.18* |
|  |  | *Min* | *0.03* | *8.92* | *0.02* | *0.03* | *20.34* | *0.54* | *8.24* | *3.53* | *0.04* | *0.06* | *0.03* |
|  |  | *Max* | *0.60* | *13.58* | *1.03* | *0.08* | *26.43* | *6.35* | *9.04* | *8.56* | *1.40* | *0.25* | *0.61* |
|  |  | ***n*** | ***54*** |  |  |  |  |  |  |  |  |  |  |

| Sample | PS | Mineral | Na | Mg | K | Ni | Si | Al | Ca | Fe | Ti | Mn | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 01619 | 22B-biotite | Biotite | 0.01 | 11.61 | 8.51 | 0.08 | 17.76 | 8.28 | 0.03 | 7.06 | 1.98 | 0.01 | 0.52 |
|  | Biotite | **Average** | **0.01** | **11.61** | **8.51** | **0.08** | **17.76** | **8.28** | **0.03** | **7.06** | **1.98** | ***<DL*** | **0.52** |
|  |  | ***n*** | ***1*** |  |  |  |  |  |  |  |  |  |  |

| Sample | PS | Mineral | Na | Mg | K | Ni | Si | Al | Ca | Fe | Ti | Mn | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Diopside | 0.14 | 9.25 | 0.00 | 0.04 | 24.33 | 1.14 | 16.67 | 4.40 | 0.20 | 0.11 | 0.25 |
| D 01618 | 12B | Diopside | 0.10 | 9.70 | 0.00 | 0.02 | 25.06 | 0.47 | 16.76 | 4.24 | 0.06 | 0.12 | 0.12 |
| D 01618 | 12B | Diopside | 0.11 | 9.49 | 0.00 | 0.02 | 24.93 | 0.70 | 16.89 | 4.27 | 0.11 | 0.11 | 0.17 |
| D 01618 | 12B | Diopside | 0.14 | 9.17 | 0.00 | 0.04 | 24.52 | 1.27 | 16.40 | 4.69 | 0.23 | 0.10 | 0.22 |
| D 01618 | 12B | Diopside | 0.07 | 9.65 | 0.00 | 0.02 | 25.11 | 0.41 | 17.39 | 3.72 | 0.05 | 0.10 | 0.12 |
| D 01618 | 12B | Diopside | 0.15 | 9.32 | 0.00 | 0.04 | 24.42 | 1.31 | 16.14 | 4.74 | 0.23 | 0.11 | 0.13 |
| D 01619 | 22B | Diopside | 0.17 | 8.97 | 0.00 | 0.03 | 24.47 | 1.11 | 16.48 | 4.72 | 0.19 | 0.13 | 0.19 |
| D 01619 | 22B | Diopside | 0.16 | 9.11 | 0.00 | 0.04 | 24.44 | 1.15 | 16.48 | 4.81 | 0.17 | 0.12 | 0.27 |
| D 01619 | 22B | Diopside | 0.16 | 9.49 | 0.00 | 0.03 | 24.76 | 0.91 | 16.48 | 4.47 | 0.11 | 0.12 | 0.25 |
| D 01619 | 22B | Diopside | 0.16 | 9.16 | 0.00 | 0.02 | 24.73 | 0.96 | 16.75 | 4.42 | 0.14 | 0.13 | 0.22 |
| D 01619 | 22B | Diopside | 0.16 | 9.23 | 0.00 | 0.04 | 24.41 | 1.12 | 16.24 | 5.02 | 0.19 | 0.13 | 0.22 |
| D 01621 | 42B | Diopside | 0.15 | 9.33 | 0.00 | 0.03 | 24.76 | 0.75 | 16.69 | 4.47 | 0.08 | 0.22 | 0.10 |
| D 01621 | 42B | Diopside | 0.10 | 9.83 | 0.00 | 0.03 | 25.18 | 0.25 | 17.10 | 3.98 | 0.01 | 0.18 | 0.10 |
| D 01621 | 42B | Diopside | 0.11 | 9.42 | 0.00 | 0.02 | 24.89 | 0.46 | 16.82 | 4.47 | 0.04 | 0.21 | 0.08 |
| D 01621 | 42B | Diopside | 0.14 | 9.29 | 0.00 | 0.03 | 24.80 | 0.74 | 16.80 | 4.41 | 0.10 | 0.20 | 0.15 |
| D 01621 | 42B | Diopside | 0.14 | 9.33 | 0.00 | 0.03 | 24.84 | 0.74 | 16.78 | 4.48 | 0.08 | 0.21 | 0.15 |
| D 01621 | 42B | Diopside | 0.10 | 10.97 | 0.02 | 0.03 | 24.63 | 0.99 | 11.09 | 8.81 | 0.12 | 0.26 | 0.17 |
| D 01622 | 52B | Diopside | 0.17 | 9.28 | 0.00 | 0.03 | 24.30 | 1.26 | 16.15 | 4.54 | 0.16 | 0.15 | 0.22 |
| D 01622 | 52B | Diopside | 0.17 | 9.29 | 0.00 | 0.05 | 24.38 | 1.20 | 16.23 | 4.47 | 0.14 | 0.15 | 0.21 |
| D 01622 | 52B | Diopside | 0.18 | 9.21 | 0.00 | 0.04 | 24.24 | 1.32 | 16.29 | 4.54 | 0.18 | 0.13 | 0.24 |
| D 01622 | 52B | Diopside | 0.17 | 9.24 | 0.01 | 0.04 | 24.22 | 1.30 | 16.27 | 4.54 | 0.18 | 0.13 | 0.24 |
| D 01622 | 52B | Diopside | 0.17 | 9.24 | 0.00 | 0.04 | 24.45 | 1.27 | 16.30 | 4.44 | 0.17 | 0.14 | 0.23 |
| D 01622 | 52B | Diopside | 0.15 | 9.42 | 0.01 | 0.04 | 24.47 | 1.24 | 16.12 | 4.54 | 0.15 | 0.14 | 0.21 |
| D 01622 | 52B | Diopside | 0.17 | 9.28 | 0.00 | 0.03 | 24.49 | 1.20 | 16.18 | 4.40 | 0.15 | 0.12 | 0.23 |
| | Diopside | ***Average*** | ***0.14*** | ***9.40*** | ***<DL*** | ***0.03*** | ***24.62*** | ***0.97*** | ***16.31*** | ***4.65*** | ***0.14*** | ***0.15*** | ***0.19*** |
| | | *SD* | *0.03* | *0.38* | | *0.01* | *0.28* | *0.33* | *1.16* | *0.92* | *0.06* | *0.04* | *0.06* |
| | | *Min* | *0.07* | *8.97* | | *0.02* | *24.22* | *0.25* | *11.09* | *3.72* | *0.01* | *0.10* | *0.08* |
| | | *Max* | *0.18* | *10.97* | | *0.05* | *25.18* | *1.32* | *17.39* | *8.81* | *0.23* | *0.26* | *0.27* |
| | | ***n*** | ***24*** | | | | | | | | | | |

| Sample | PS | Mineral | Na | Mg | K | Ni | Si | Al | Ca | Fe | Ti | Mn | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Enstatite | 0.00 | 15.45 | 0.01 | 0.04 | 25.10 | 0.66 | 0.28 | 14.06 | 0.06 | 0.28 | 0.08 |
| D 01618 | 12B | Enstatite | 0.00 | 16.39 | 0.00 | 0.03 | 25.40 | 0.60 | 0.31 | 12.39 | 0.05 | 0.37 | 0.07 |
| D 01618 | 12B | Enstatite | 0.00 | 16.17 | 0.00 | 0.05 | 25.19 | 0.70 | 0.28 | 13.03 | 0.06 | 0.33 | 0.09 |
| D 01618 | 12B | Enstatite | 0.00 | 16.46 | 0.00 | 0.04 | 25.37 | 0.66 | 0.32 | 12.03 | 0.06 | 0.34 | 0.08 |
| D 01618 | 12B | Enstatite | 0.00 | 16.05 | 0.01 | 0.05 | 25.27 | 0.70 | 0.23 | 13.03 | 0.04 | 0.37 | 0.07 |
| D 01618 | 12B | Enstatite | 0.00 | 15.46 | 0.00 | 0.04 | 25.06 | 0.70 | 0.28 | 13.78 | 0.07 | 0.27 | 0.11 |
| D 01619 | 22B | Enstatite | 0.00 | 15.81 | 0.00 | 0.05 | 25.23 | 0.65 | 0.27 | 13.92 | 0.04 | 0.27 | 0.12 |
| D 01619 | 22B | Enstatite | 0.01 | 15.79 | 0.00 | 0.05 | 24.95 | 0.61 | 0.29 | 14.01 | 0.06 | 0.35 | 0.06 |
| D 01619 | 22B | Enstatite | 0.00 | 15.55 | 0.00 | 0.04 | 24.89 | 0.64 | 0.41 | 13.78 | 0.08 | 0.34 | 0.07 |
| D 01619 | 22B | Enstatite | 0.00 | 15.34 | 0.00 | 0.04 | 25.03 | 0.57 | 0.26 | 14.82 | 0.04 | 0.31 | 0.09 |
| D 01619 | 22B | Enstatite | 0.00 | 15.54 | 0.00 | 0.05 | 24.84 | 0.73 | 0.28 | 14.12 | 0.06 | 0.28 | 0.16 |
| D 01619 | 22B | Enstatite | 0.00 | 15.31 | 0.00 | 0.02 | 24.98 | 0.52 | 0.27 | 14.74 | 0.04 | 0.30 | 0.06 |
| D 01621 | 42B | Enstatite | 0.00 | 14.43 | 0.01 | 0.03 | 25.17 | 0.39 | 0.24 | 15.16 | 0.03 | 0.66 | 0.02 |
| D 01621 | 42B | Enstatite | 0.01 | 15.06 | 0.00 | 0.03 | 25.14 | 0.47 | 0.35 | 14.11 | 0.03 | 0.63 | 0.03 |
| D 01621 | 42B | Enstatite | 0.00 | 15.20 | 0.00 | 0.02 | 24.97 | 0.58 | 0.26 | 14.43 | 0.03 | 0.66 | 0.04 |
| D 01621 | 42B | Enstatite | 0.00 | 15.53 | 0.00 | 0.02 | 25.21 | 0.40 | 0.14 | 14.20 | 0.01 | 0.48 | 0.03 |
| D 01621 | 42B | Enstatite | 0.00 | 15.38 | 0.00 | 0.01 | 25.11 | 0.48 | 0.21 | 14.27 | 0.03 | 0.62 | 0.05 |
| D 01622 | 52B | Enstatite | 0.00 | 16.19 | 0.00 | 0.04 | 25.23 | 0.75 | 0.31 | 12.62 | 0.04 | 0.34 | 0.09 |
| D 01622 | 52B | Enstatite | 0.00 | 16.31 | 0.01 | 0.03 | 25.14 | 0.79 | 0.30 | 12.43 | 0.04 | 0.40 | 0.09 |
| D 01622 | 52B | Enstatite | 0.00 | 16.27 | 0.00 | 0.03 | 25.07 | 0.70 | 0.28 | 12.83 | 0.04 | 0.32 | 0.09 |
| D 01622 | 52B | Enstatite | 0.00 | 16.31 | 0.00 | 0.04 | 25.20 | 0.78 | 0.25 | 12.55 | 0.04 | 0.32 | 0.10 |
| D 01622 | 52B | Enstatite | 0.00 | 16.48 | 0.00 | 0.03 | 25.40 | 0.70 | 0.23 | 12.14 | 0.05 | 0.40 | 0.09 |
| D 01622 | 52B | Enstatite | 0.01 | 16.26 | 0.00 | 0.04 | 25.26 | 0.74 | 0.34 | 12.50 | 0.04 | 0.34 | 0.09 |
| | Enstatite | ***Average*** | ***<DL*** | ***15.77*** | ***<DL*** | ***0.04*** | ***25.14*** | ***0.63*** | ***0.28*** | ***13.52*** | ***0.04*** | ***0.39*** | ***0.08*** |
| | | *SD* | | *0.54* | | *0.01* | *0.15* | *0.11* | *0.05* | *0.94* | *0.02* | *0.13* | *0.03* |
| | | *Min* | | *14.43* | | *0.01* | *24.84* | *0.39* | *0.14* | *12.03* | *0.01* | *0.27* | *0.02* |
| | | *Max* | | *16.48* | | *0.05* | *25.40* | *0.79* | *0.41* | *15.16* | *0.08* | *0.66* | *0.16* |
| | | ***n*** | ***23*** | | | | | | | | | | |

| Sample | PS | Mineral | Na | Mg | K | Ni | Si | Al | Ca | Fe | Ti | Mn | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 01618 | 12B | Talc | 0.02 | 17.37 | 0.09 | 0.11 | 28.62 | 0.54 | 0.02 | 2.78 | 0.03 | 0.01 | 0.07 |
| D 01618 | 12B | Talc | 0.05 | 17.53 | 0.03 | 0.12 | 28.75 | 0.69 | 0.02 | 3.17 | 0.03 | 0.01 | 0.07 |
| D 01618 | 12B | Talc | 0.05 | 17.99 | 0.02 | 0.12 | 28.94 | 0.65 | 0.02 | 3.04 | 0.03 | 0.01 | 0.07 |
| | Talc | ***Average*** | ***0.04*** | ***17.63*** | ***0.04*** | ***0.12*** | ***28.77*** | ***0.62*** | ***0.02*** | ***3.00*** | ***0.03*** | ***<DL*** | ***0.07*** |
| | | *SD* | *0.02* | *0.32* | *0.04* | *0.01* | *0.16* | *0.08* | *0.00* | *0.20* | *0.00* | | *0.00* |
| | | *Min* | *0.02* | *17.37* | *0.02* | *0.11* | *28.62* | *0.54* | *0.02* | *2.78* | *0.03* | | *0.07* |
| | | *Max* | *0.05* | *17.99* | *0.09* | *0.12* | *28.94* | *0.69* | *0.02* | *3.17* | *0.03* | | *0.07* |
| | | ***n*** | ***3*** | | | | | | | | | | |

CAVM-14021-103
North American Nickel

Detection Limits (elemental wt%)

| **DL** | **As** | **Ni** | **S** | **Fe** | **Co** | **Cu** | **Zn** |
|---|---|---|---|---|---|---|---|
| Pyrrhotite | 0.096 | 0.036 | 0.019 | 0.023 | 0.034 | 0.031 | 0.037 |
| Pentlandite | 0.095 | 0.044 | 0.020 | 0.021 | 0.034 | 0.033 | 0.037 |
| Pyrite | 0.092 | 0.036 | 0.018 | 0.022 | 0.032 | 0.030 | 0.034 |
| Chalcopyrite | 0.097 | 0.039 | 0.018 | 0.022 | 0.033 | 0.034 | 0.038 |

| **DL** | **Al** | **Ca** | **Cr** | **Fe** | **K** | **Mg** | **Mn** | **Na** | **Ni** | **Si** | **Ti** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Silicates | 0.010 | 0.013 | 0.020 | 0.015 | 0.013 | 0.016 | 0.016 | 0.006 | 0.014 | 0.010 | 0.016 |

| | **Al2O3** | **CaO** | **Cr2O3** | **FeO** | **K2O** | **MgO** | **MnO** | **Na2O** | **NiO** | **SiO2** | **TiO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Silicates | 0.0194 | 0.0183 | 0.0287 | 0.0195 | 0.016 | 0.0268 | 0.0202 | 0.018 | 0.0182 | 0.0206 | 0.0267 |

| | Al2O3 | CaO | Cr2O3 | FeO | K2O | MgO | MnO | Na2O | NiO | SiO2 | TiO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conv divisor | 1.8895 | 1.3992 | 1.4616 | 1.2865 | 1.2046 | 1.6583 | 1.2912 | 2.98 | 1.2726 | 2.1394 | 1.6683 |

# *Appendix D – QEMSCAN Data*

North American Nickel
CAVM-14021-103
MI7011-OCT15

*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Modals**

| Survey | | CAVM-14021-103 / MI7011-OCT15 | | | | |
|---|---|---|---|---|---|---|
| Project | | North American Nickel | | | | |
| Sample | | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
| Fraction | | Core | Core | Core | Core | Core |
| Mass Size Distribution (%) | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | | Sample | Sample | Sample | Sample | Sample |
| Mineral Mass (%) | Pentlandite | 7.97 | 12.1 | 12.5 | 6.94 | 11.8 |
| | Chalcopyrite | 0.22 | 1.62 | 0.54 | 1.11 | 2.23 |
| | Pyrrhotite | 43.4 | 19.2 | 55.2 | 33.9 | 40.3 |
| | Pyrite | 2.65 | 3.07 | 2.09 | 22.7 | 3.63 |
| | Quartz | 0.27 | 0.34 | 0.36 | 0.27 | 0.12 |
| | Feldspars | 3.09 | 5.88 | 3.42 | 1.05 | 0.51 |
| | Orthopyroxene | 15.7 | 25.8 | 6.37 | 4.95 | 23.6 |
| | Clinopyroxene | 6.13 | 11.0 | 3.96 | 3.45 | 9.91 |
| | Amphibole | 16.1 | 20.1 | 14.9 | 24.9 | 7.48 |
| | Biotite/Phlogopite | 0.09 | 0.28 | 0.14 | 0.07 | 0.01 |
| | Talc | 3.63 | 0.11 | 0.07 | 0.06 | 0.13 |
| | Chlorite | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Other Silicates | 0.05 | 0.07 | 0.03 | 0.02 | 0.04 |
| | Carbonates | 0.62 | 0.46 | 0.31 | 0.59 | 0.28 |
| | Oxides | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| | Apatite | 0.01 | 0.01 | 0.04 | 0.02 | 0.00 |
| | Other | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Mean Grain Size by Frequency (μm) | Pentlandite | 135 | 205 | 244 | 196 | 194 |
| | Chalcopyrite | 47 | 69 | 71 | 97 | 102 |
| | Pyrrhotite | 297 | 217 | 583 | 427 | 371 |
| | Pyrite | 283 | 111 | 543 | 1022 | 168 |
| | Quartz | 48 | 43 | 51 | 41 | 59 |
| | Feldspars | 392 | 410 | 391 | 241 | 166 |
| | Orthopyroxene | 158 | 248 | 186 | 135 | 298 |
| | Clinopyroxene | 180 | 238 | 240 | 206 | 269 |
| | Amphibole | 162 | 194 | 243 | 347 | 139 |
| | Biotite/Phlogopite | 55 | 64 | 57 | 47 | 39 |
| | Talc | 85 | 47 | 44 | 40 | 54 |
| | Chlorite | 31 | 31 | 32 | 31 | 30 |
| | Other Silicates | 30 | 30 | 30 | 30 | 30 |
| | Carbonates | 52 | 44 | 46 | 48 | 45 |
| | Oxides | 34 | 33 | 29 | 30 | 29 |
| | Apatite | 88 | 94 | 139 | 88 | 37 |
| | Other | 29 | 29 | 29 | 29 | 29 |

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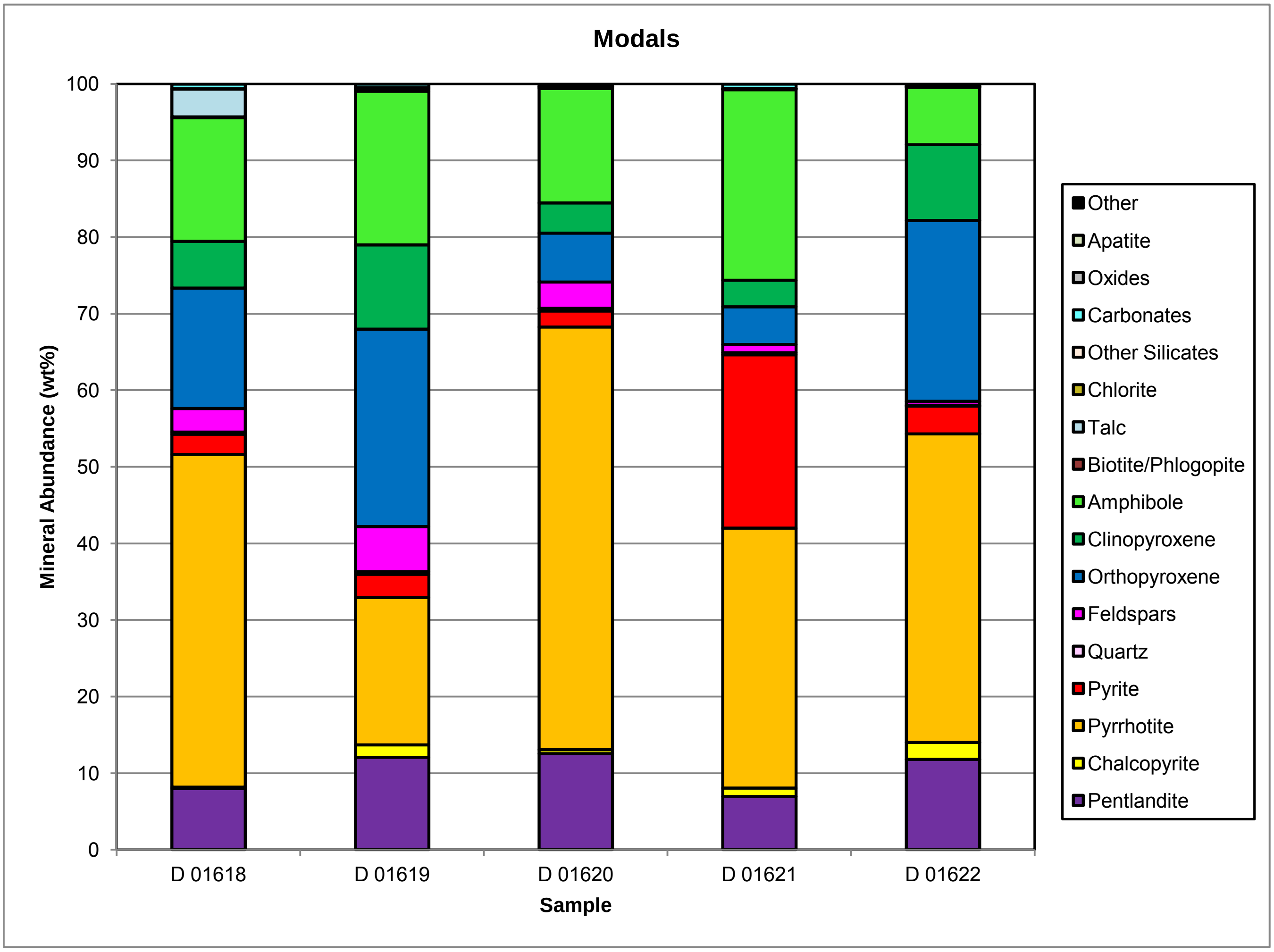

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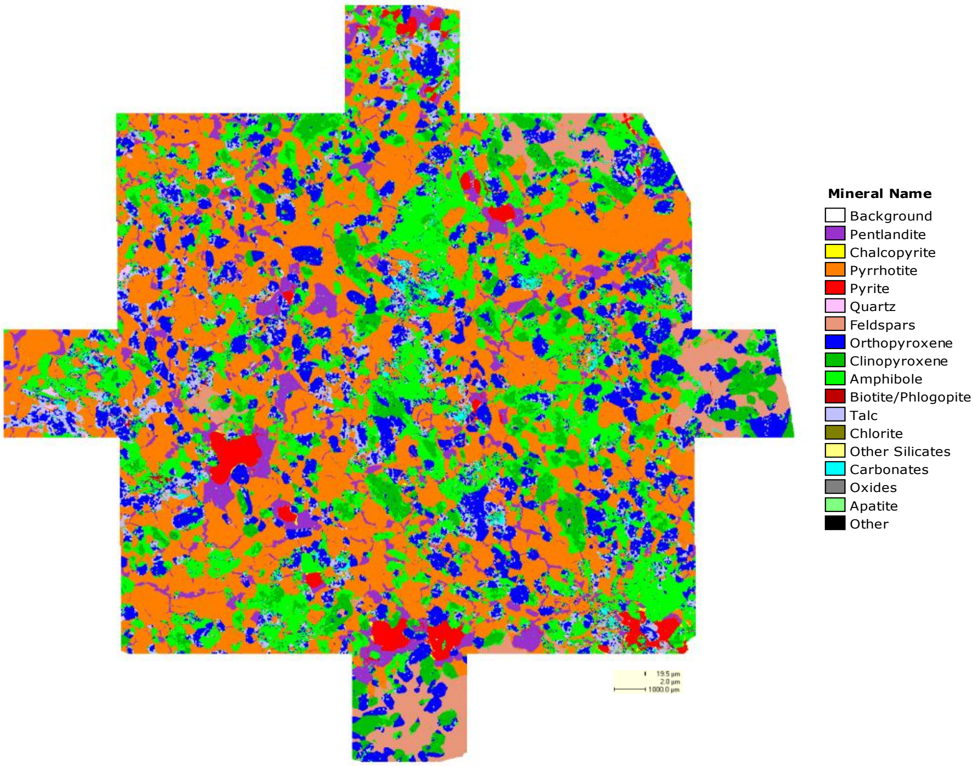
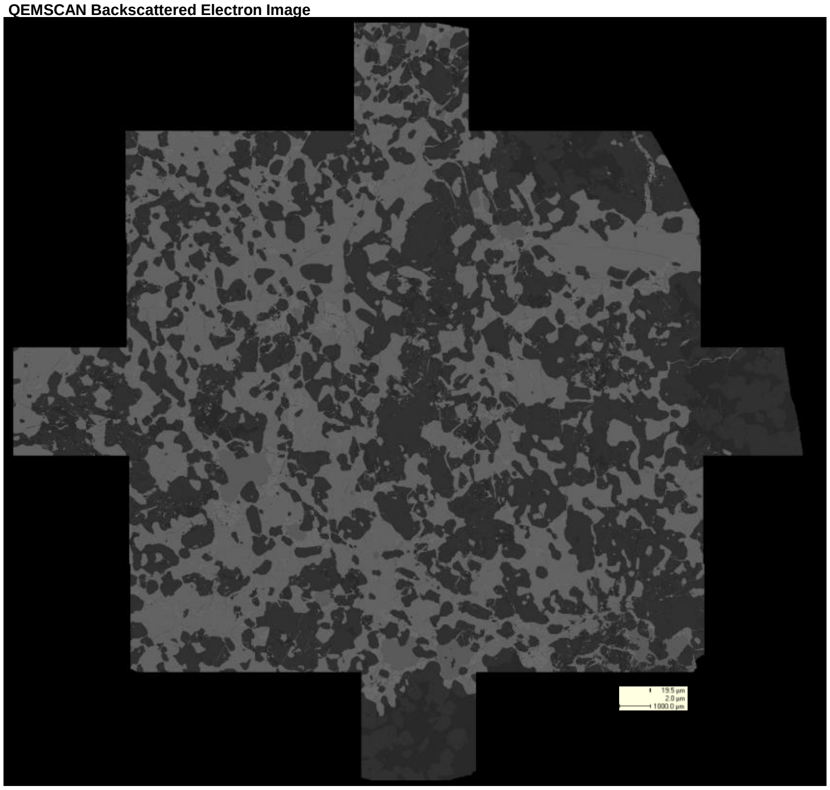
*High Definition Mineralogical Analysis using QEMSCAN*
*(Quantitative Evaluation of Materials by Scanning Electron*

**Sample: D 01618**

**QEMSCAN Pseudo Colour Image**

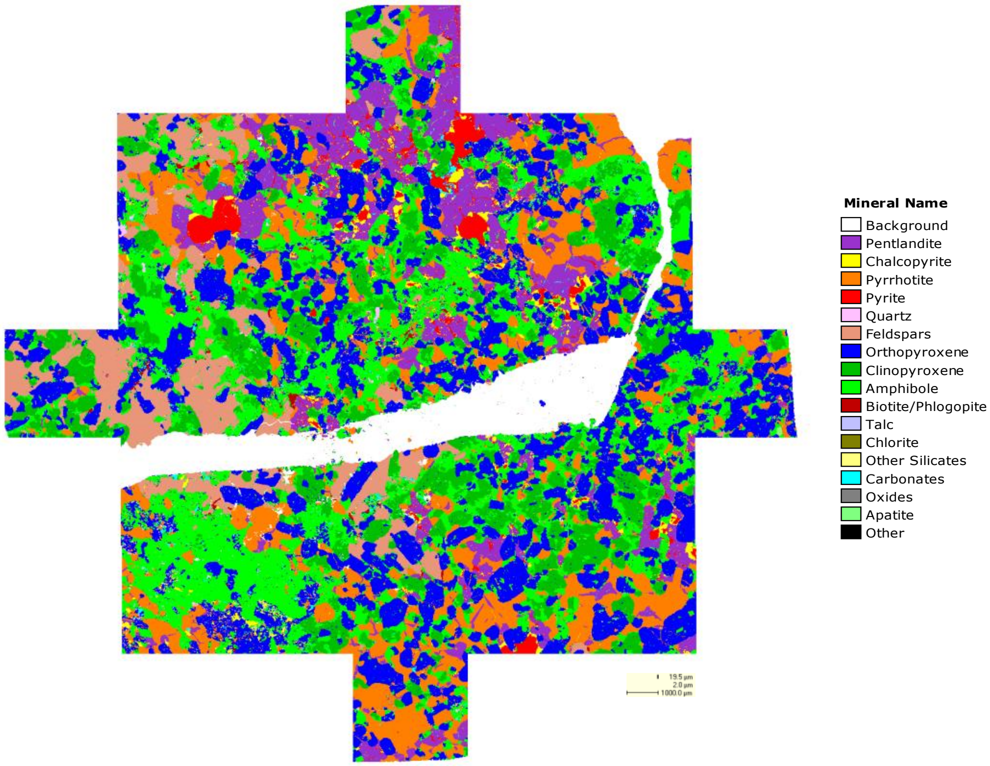



**QEMSCAN Backscattered Electron Image**

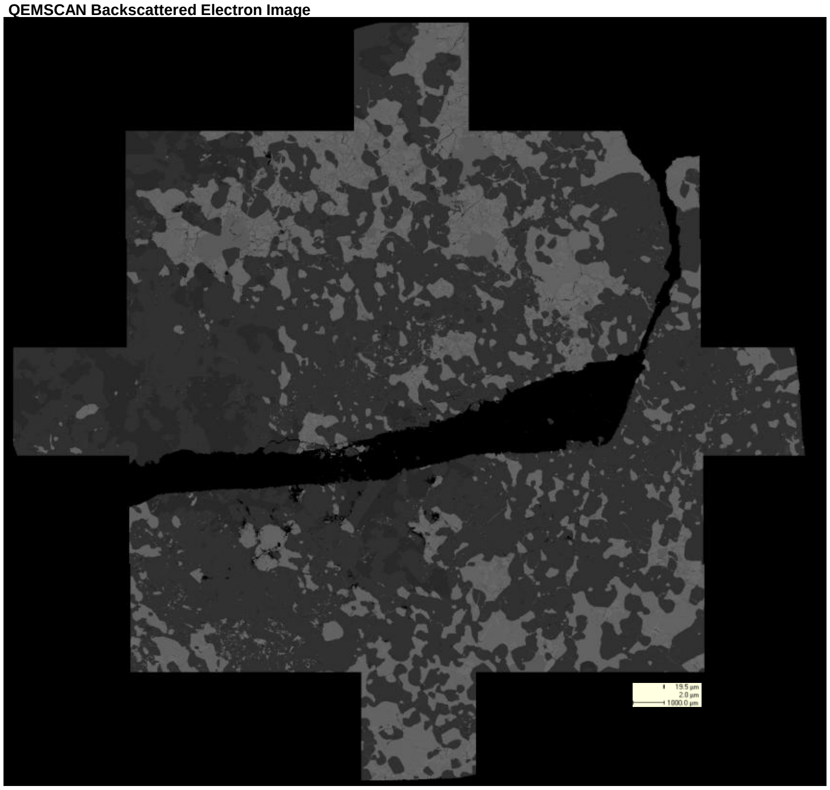


**Sample: D 01619**

**QEMSCAN Pseudo Colour Image**

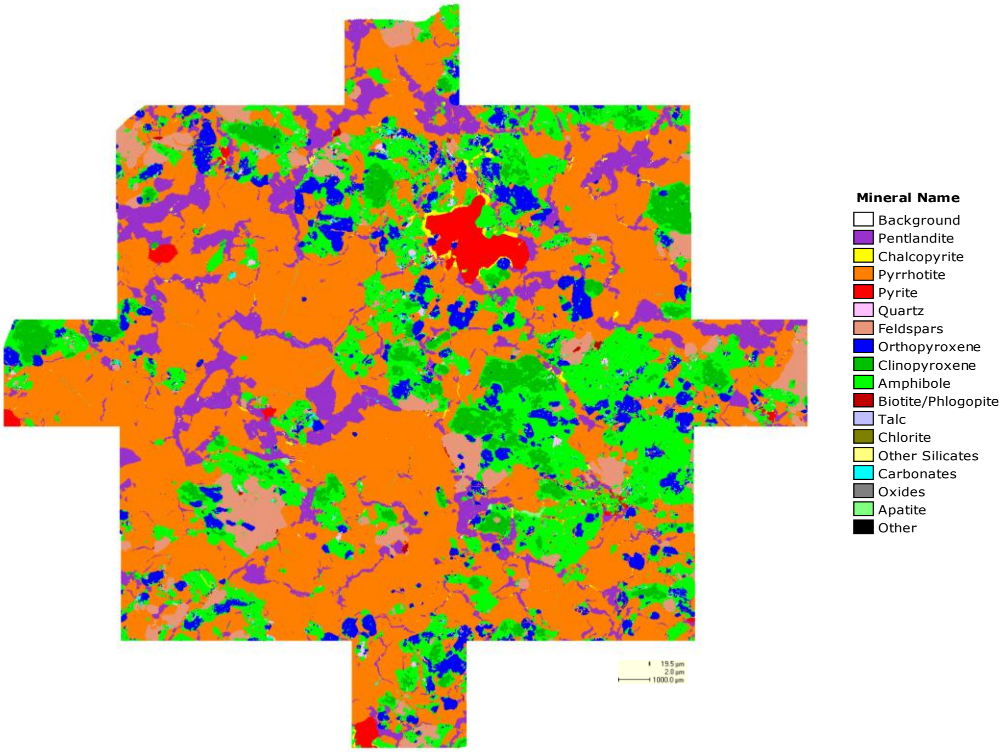



**QEMSCAN Backscattered Electron Image**

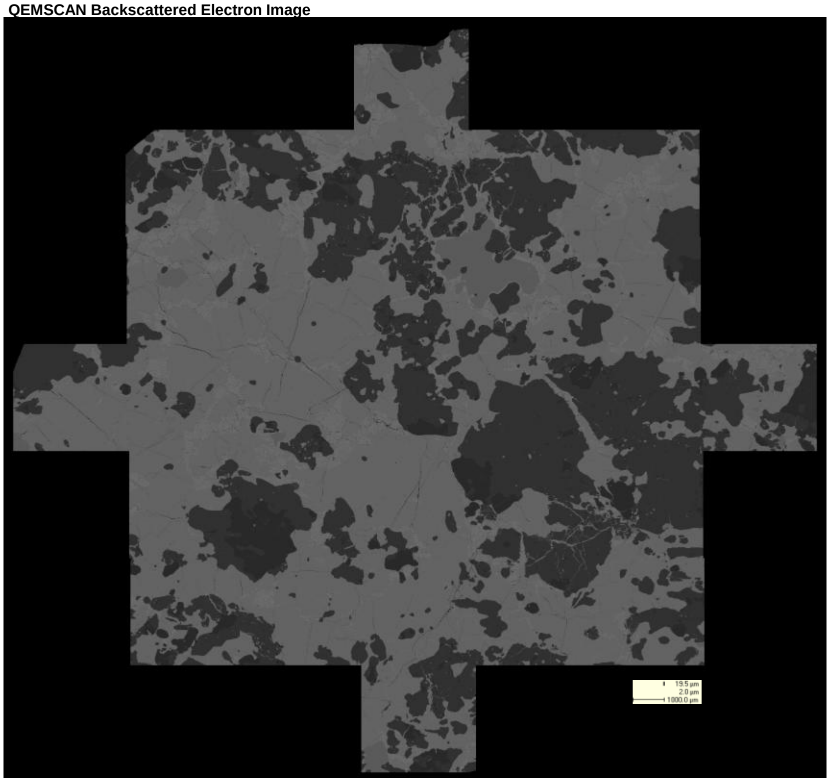


**Sample: D 01620**

**QEMSCAN Pseudo Colour Image**

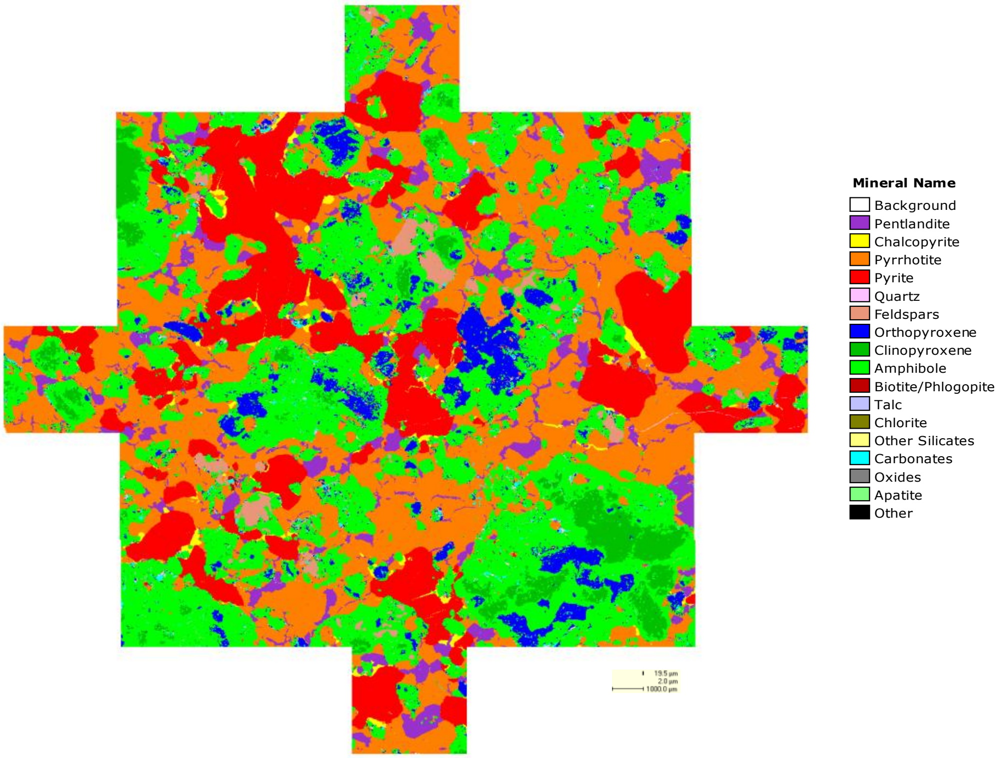



**QEMSCAN Backscattered Electron Image**

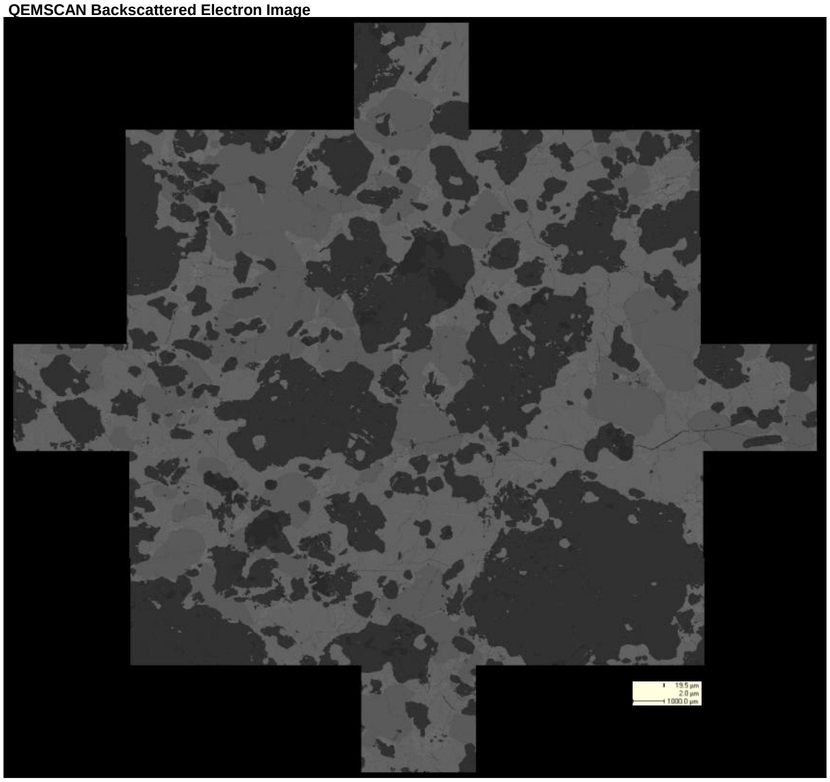


**Sample: D 01621**

**QEMSCAN Pseudo Colour Image**

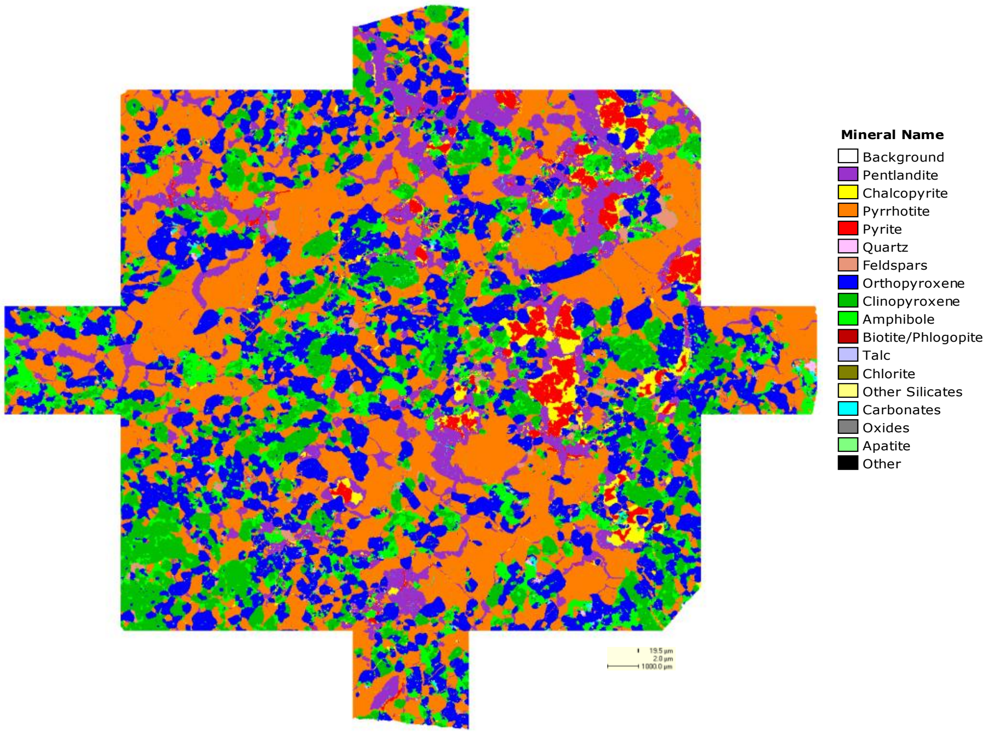



**QEMSCAN Backscattered Electron Image**

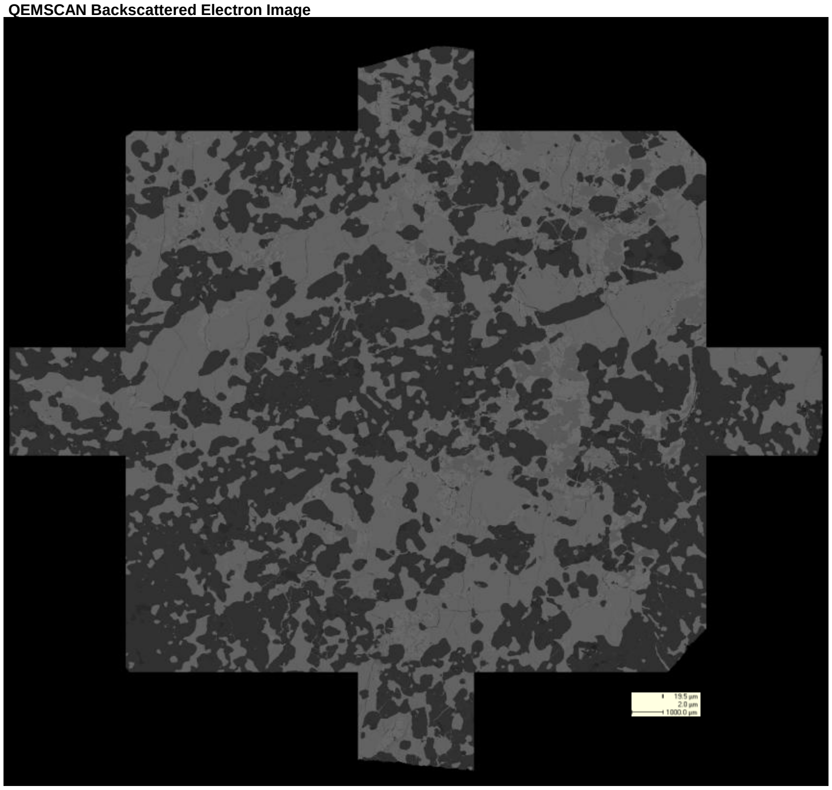


**Sample: D 01622**

**QEMSCAN Pseudo Colour Image**




**QEMSCAN Backscattered Electron Image**



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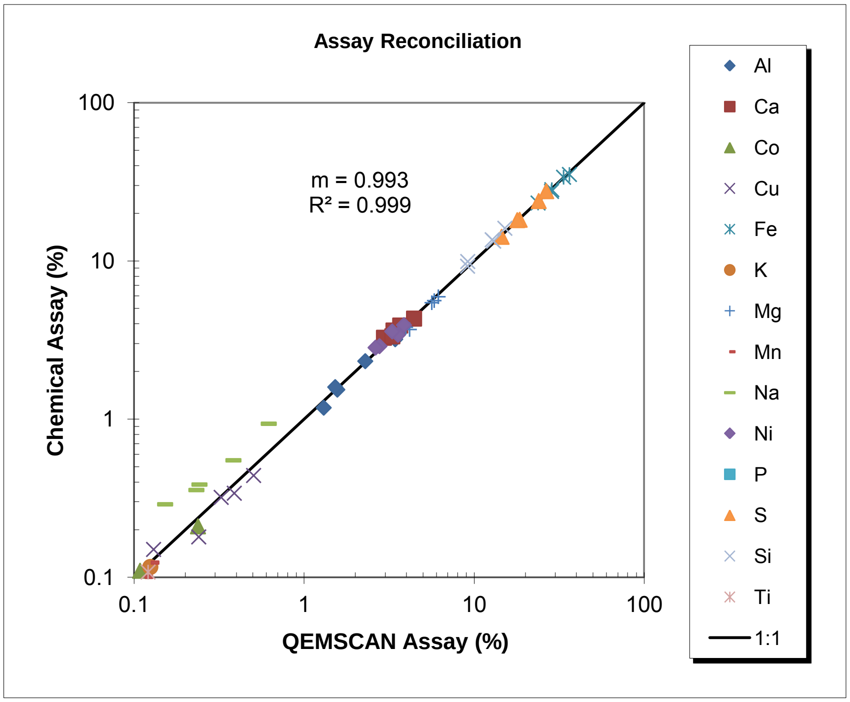
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Assay Reconciliation**




| Sample | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Element** | **P90 150 µm** | **P90 150 µm** | **P90 150 µm** | **P90 150 µm** | **P90 150 µm** |
| Al (QEMSCAN) | 2.29 | 3.43 | 1.57 | 1.30 | 1.52 |
| Al (Chemical) | 2.32 | 3.20 | 1.53 | 1.18 | 1.59 |
| Ca (QEMSCAN) | 3.36 | 4.43 | 2.95 | 3.30 | 3.68 |
| Ca (Chemical) | 3.63 | 4.32 | 3.27 | 3.34 | 3.90 |
| Co (QEMSCAN) | 0.11 | 0.08 | 0.10 | 0.24 | 0.11 |
| Co (Chemical) | 0.08 | 0.08 | 0.13 | 0.21 | 0.11 |
| Cu (QEMSCAN) | 0.13 | 0.33 | 0.24 | 0.39 | 0.50 |
| Cu (Chemical) | 0.15 | 0.32 | 0.18 | 0.34 | 0.44 |
| Fe (QEMSCAN) | 28.5 | 23.8 | 36.3 | 33.6 | 28.6 |
| Fe (Chemical) | 27.5 | 23.2 | 35.2 | 33.8 | 28.2 |
| K (QEMSCAN) | 0.09 | 0.12 | 0.10 | 0.12 | 0.04 |
| K (Chemical) | 0.09 | 0.12 | 0.08 | 0.07 | 0.04 |
| Mg (QEMSCAN) | 5.64 | 5.82 | 3.96 | 4.17 | 6.16 |
| Mg (Chemical) | 5.44 | 5.61 | 3.81 | 3.68 | 5.93 |
| Mn (QEMSCAN) | 0.09 | 0.12 | 0.07 | 0.07 | 0.13 |
| Mn (Chemical) | 0.09 | 0.10 | 0.09 | 0.12 | 0.12 |
| Na (QEMSCAN) | 0.38 | 0.62 | 0.23 | 0.15 | 0.24 |
| Na (Chemical) | 0.55 | 0.93 | 0.36 | 0.29 | 0.39 |
| Ni (QEMSCAN) | 3.57 | 2.78 | 3.30 | 2.63 | 3.87 |
| Ni (Chemical) | 3.41 | 2.89 | 3.58 | 2.83 | 3.93 |
| P (QEMSCAN) | 0.01 | 0.00 | 0.02 | 0.02 | 0.00 |
| P (Chemical) | 0.01 | 0.00 | 0.02 | 0.02 | 0.00 |
| S (QEMSCAN) | 18.5 | 14.5 | 24.0 | 26.6 | 17.9 |
| S (Chemical) | 18.2 | 14.2 | 23.9 | 27.6 | 18.1 |
| Si (QEMSCAN) | 12.8 | 15.2 | 9.17 | 9.15 | 13.0 |
| Si (Chemical) | 13.6 | 16.1 | 9.91 | 9.26 | 13.3 |
| Ti (QEMSCAN) | 0.11 | 0.12 | 0.12 | 0.14 | 0.08 |
| Ti (Chemical) | 0.10 | 0.11 | 0.09 | 0.08 | 0.08 |

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*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Modals**

| Survey | | CAVM-14021-103 / MI7011-OCT15 | | | | |
|---|---|---|---|---|---|---|
| Project | | North American Nickel | | | | |
| Sample | | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
| Fraction | | P90 150 µm | P90 150 µm | P90 150 µm | P90 150 µm | P90 150 µm |
| Mass Size Distribution (%) | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Calculated ESD Particle Size (µm) | | 26 | 30 | 28 | 28 | 29 |
| | | Sample | Sample | Sample | Sample | Sample |
| Mineral Mass (%) | Pentlandite | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |
| | Chalcopyrite | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |
| | Pyrrhotite | 34.3 | 26.9 | 49.6 | 30.5 | 33.1 |
| | Pyrite | 3.33 | 2.17 | 2.58 | 22.3 | 1.86 |
| | Quartz | 0.23 | 0.33 | 0.49 | 0.43 | 0.09 |
| | Feldspars | 9.65 | 16.5 | 5.07 | 2.16 | 5.78 |
| | Orthopyroxene | 14.8 | 19.7 | 9.11 | 6.08 | 23.7 |
| | Clinopyroxene | 5.01 | 8.24 | 3.87 | 3.81 | 13.3 |
| | Amphibole | 16.0 | 15.9 | 18.5 | 25.1 | 9.12 |
| | Biotite/Phlogopite | 0.30 | 0.67 | 0.31 | 0.22 | 0.06 |
| | Talc | 5.06 | 0.22 | 0.17 | 0.14 | 0.54 |
| | Chlorite | 0.08 | 0.05 | 0.06 | 0.03 | 0.04 |
| | Other Silicates | 0.34 | 0.11 | 0.05 | 0.03 | 0.10 |
| | Carbonates | 1.07 | 0.90 | 0.89 | 1.11 | 0.60 |
| | Oxides | 0.08 | 0.04 | 0.03 | 0.04 | 0.02 |
| | Apatite | 0.05 | 0.02 | 0.13 | 0.11 | 0.02 |
| | Other | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Mean Grain Size by Frequency (µm) | Pentlandite | 23 | 22 | 23 | 24 | 23 |
| | Chalcopyrite | 12 | 15 | 18 | 17 | 18 |
| | Pyrrhotite | 24 | 27 | 28 | 23 | 25 |
| | Pyrite | 20 | 18 | 19 | 33 | 14 |
| | Quartz | 17 | 18 | 19 | 19 | 19 |
| | Feldspars | 28 | 33 | 30 | 30 | 30 |
| | Orthopyroxene | 17 | 24 | 17 | 12 | 26 |
| | Clinopyroxene | 27 | 30 | 27 | 30 | 33 |
| | Amphibole | 21 | 24 | 25 | 27 | 21 |
| | Biotite/Phlogopite | 13 | 18 | 15 | 19 | 11 |
| | Talc | 18 | 9 | 9 | 9 | 10 |
| | Chlorite | 7 | 7 | 8 | 8 | 7 |
| | Other Silicates | 7 | 6 | 6 | 6 | 6 |
| | Carbonates | 11 | 11 | 12 | 13 | 11 |
| | Oxides | 11 | 8 | 9 | 9 | 9 |
| | Apatite | 20 | 9 | 26 | 22 | 11 |
| | Other | 9 | 8 | 9 | 8 | 8 |

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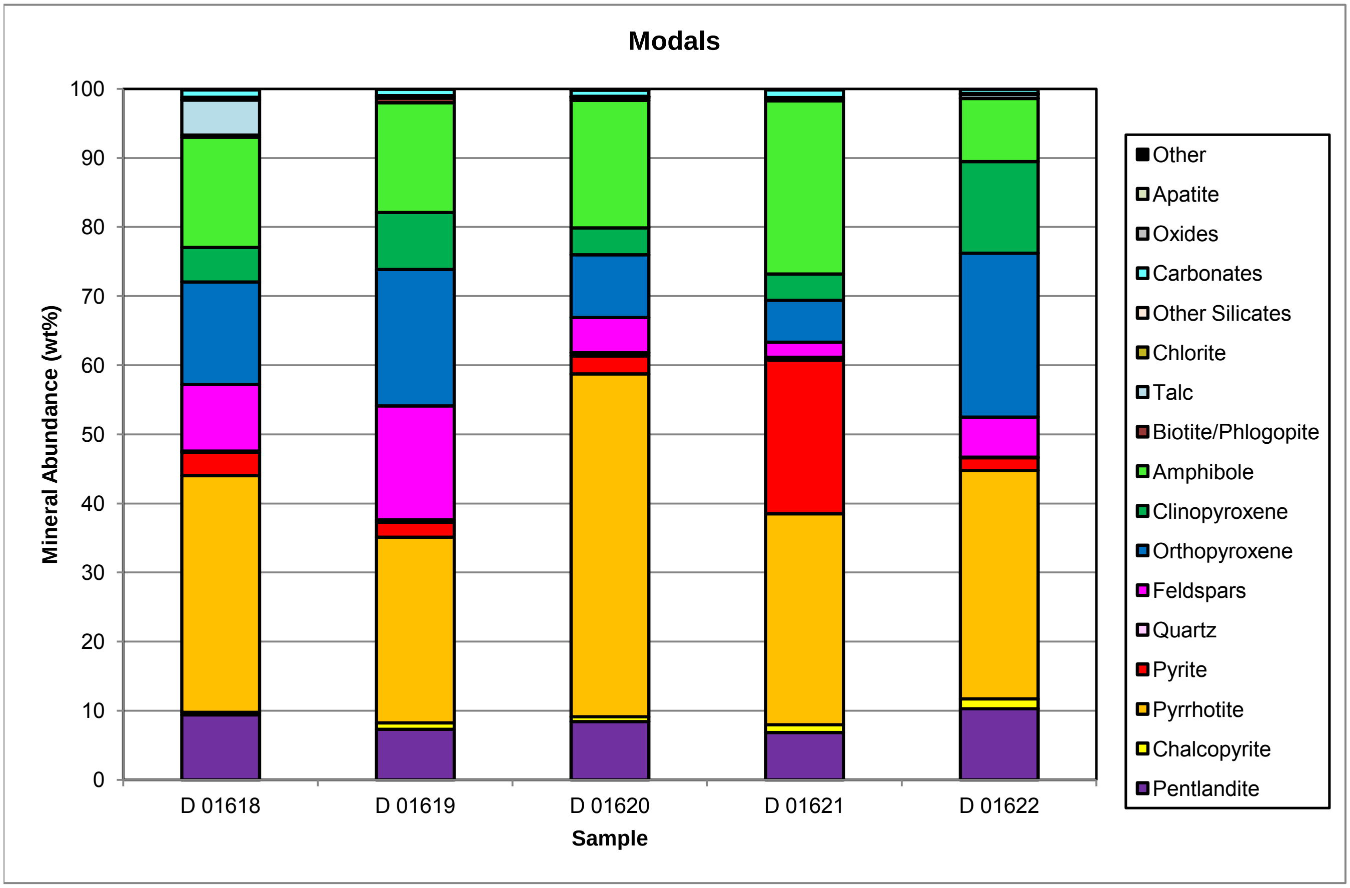

North American Nickel
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*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Modals**

| | Composite Head Modal Mineral Mass (%) | | | | |
|---|---|---|---|---|---|
| **Modal** | **D 01618** | **D 01619** | **D 01620** | **D 01621** | **D 01622** |
| **Pentlandite** | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |
| **Chalcopyrite** | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |
| **Pyrrhotite** | 34.3 | 26.9 | 49.6 | 30.5 | 33.1 |
| **Pyrite** | 3.33 | 2.17 | 2.58 | 22.3 | 1.86 |
| **Quartz** | 0.23 | 0.33 | 0.49 | 0.43 | 0.09 |
| **Feldspars** | 9.65 | 16.5 | 5.07 | 2.16 | 5.78 |
| **Orthopyroxene** | 14.8 | 19.7 | 9.11 | 6.08 | 23.7 |
| **Clinopyroxene** | 5.01 | 8.24 | 3.87 | 3.81 | 13.3 |
| **Amphibole** | 16.0 | 15.9 | 18.5 | 25.1 | 9.12 |
| **Biotite/Phlogopite** | 0.30 | 0.67 | 0.31 | 0.22 | 0.06 |
| **Talc** | 5.06 | 0.22 | 0.17 | 0.14 | 0.54 |
| **Chlorite** | 0.08 | 0.05 | 0.06 | 0.03 | 0.04 |
| **Other Silicates** | 0.34 | 0.11 | 0.05 | 0.03 | 0.10 |
| **Carbonates** | 1.07 | 0.90 | 0.89 | 1.11 | 0.60 |
| **Oxides** | 0.08 | 0.04 | 0.03 | 0.04 | 0.02 |
| **Apatite** | 0.05 | 0.02 | 0.13 | 0.11 | 0.02 |
| **Other** | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| **Total** | 100 | 100 | 100 | 100 | 100 |

| | Composite Head Modal Mineral Grain Size (µm) | | | | |
|---|---|---|---|---|---|
| **Modal** | **D 01618** | **D 01619** | **D 01620** | **D 01621** | **D 01622** |
| Pentlandite | 22.9 | 21.8 | 23.3 | 23.5 | 23.3 |
| Chalcopyrite | 12.4 | 14.9 | 18.2 | 16.6 | 17.7 |
| Pyrrhotite | 23.9 | 26.7 | 27.6 | 22.8 | 25.3 |
| Pyrite | 19.9 | 18.1 | 18.7 | 32.5 | 14.2 |
| Quartz | 17.2 | 18.3 | 19.0 | 19.3 | 18.5 |
| Feldspars | 28.2 | 33.0 | 30.1 | 30.1 | 29.5 |
| Orthopyroxene | 17.3 | 23.9 | 17.2 | 12.3 | 26.4 |
| Clinopyroxene | 27.3 | 30.3 | 26.6 | 30.3 | 33.0 |
| Amphibole | 21.3 | 24.1 | 25.4 | 27.2 | 21.4 |
| Biotite/Phlogopite | 13.1 | 18.1 | 15.5 | 19.3 | 11.3 |
| Talc | 18.1 | 9.25 | 9.24 | 9.45 | 10.5 |
| Chlorite | 6.84 | 6.98 | 7.51 | 7.90 | 6.65 |
| Other Silicates | 6.77 | 6.37 | 6.44 | 6.49 | 6.26 |
| Carbonates | 10.6 | 10.7 | 11.5 | 13.1 | 10.6 |
| Oxides | 11.0 | 8.40 | 9.19 | 9.07 | 9.08 |
| Apatite | 19.8 | 8.92 | 26.2 | 22.5 | 11.1 |
| Other | 8.57 | 7.92 | 9.04 | 7.69 | 7.70 |

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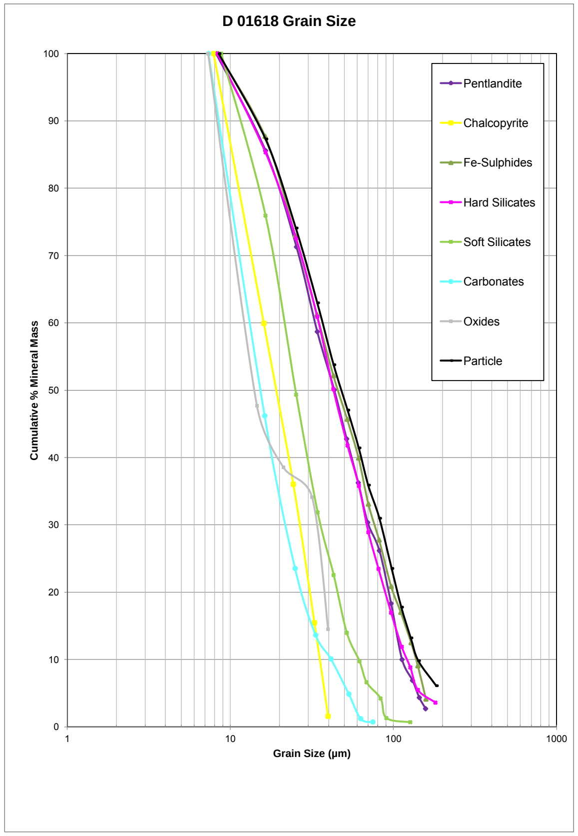
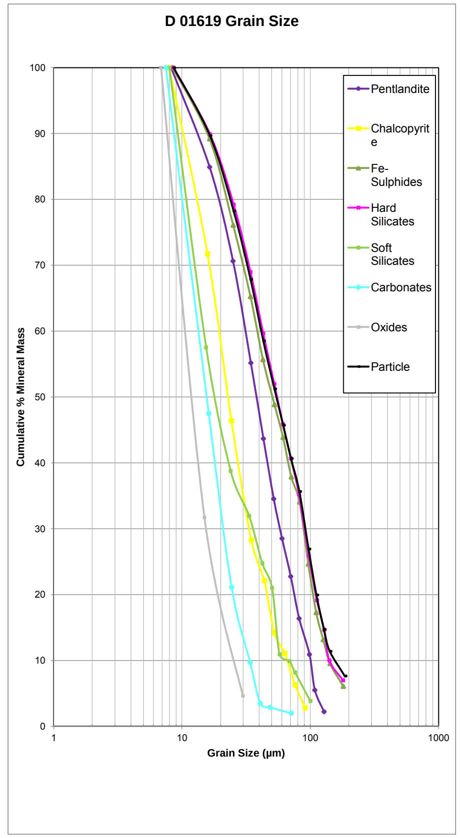
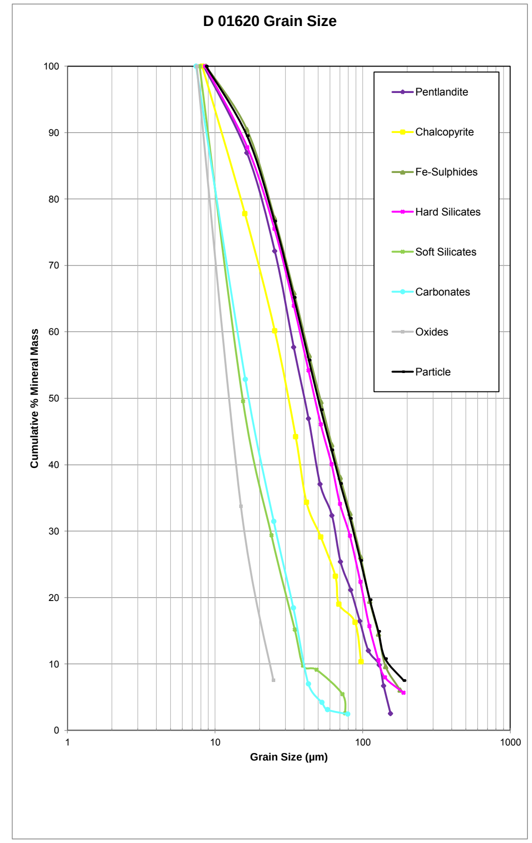
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Cumulative Grain Size Distribution**




| Mineral D50 | Sample ID | | | | |
|---|---|---|---|---|---|
| | D 01618 Grain Size | D 01619 Grain Size | D 01620 Grain Size | D 01621 Grain Size | D 01622 Grain Size |
| Pentlandite | 43 | 38 | 40 | 41 | 41 |
| Chalcopyrite | 19 | 23 | 32 | 27 | 29 |
| Fe-Sulphides | 46 | 51 | 52 | 56 | 44 |
| Hard Silicates | 43 | 55 | 48 | 49 | 55 |
| Soft Silicates | 25 | 19 | 15 | 17 | 14 |
| Carbonates | 16 | 16 | 17 | 21 | 16 |
| Oxides | 14 | 13 | 13 | 13 | 12 |
| Particle | 48 | 55 | 50 | 52 | 51 |

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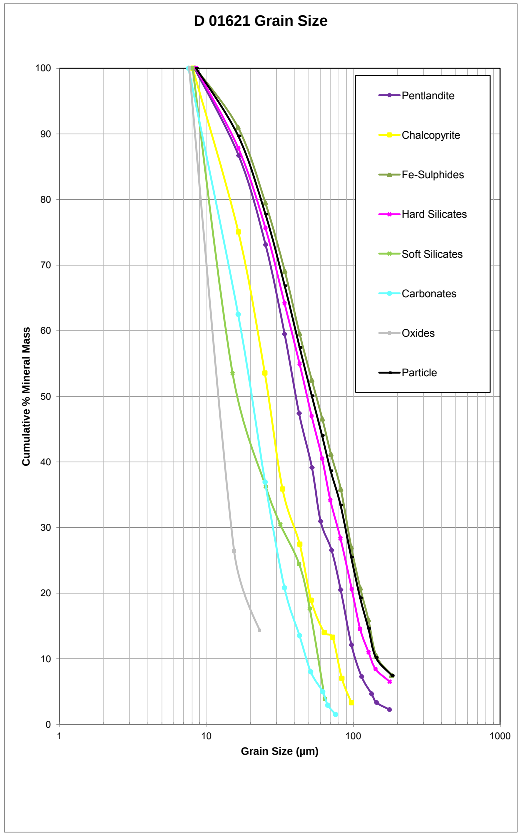
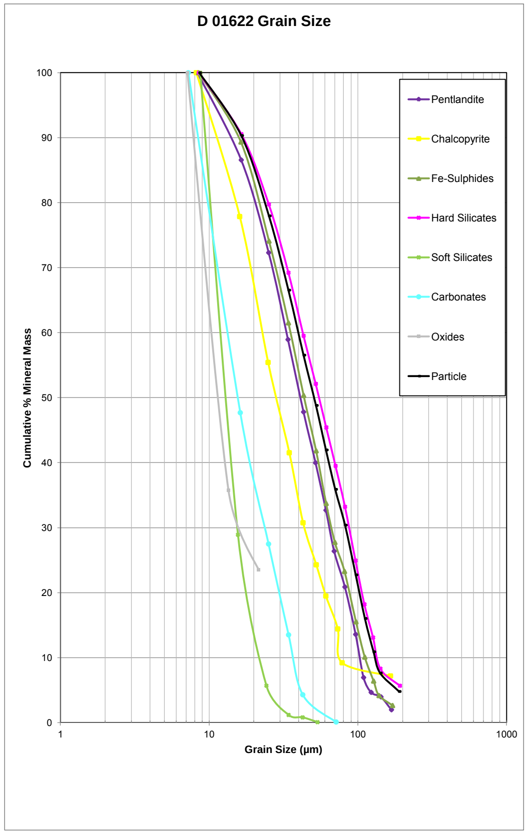
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Cumulative Grain Size Distribution**



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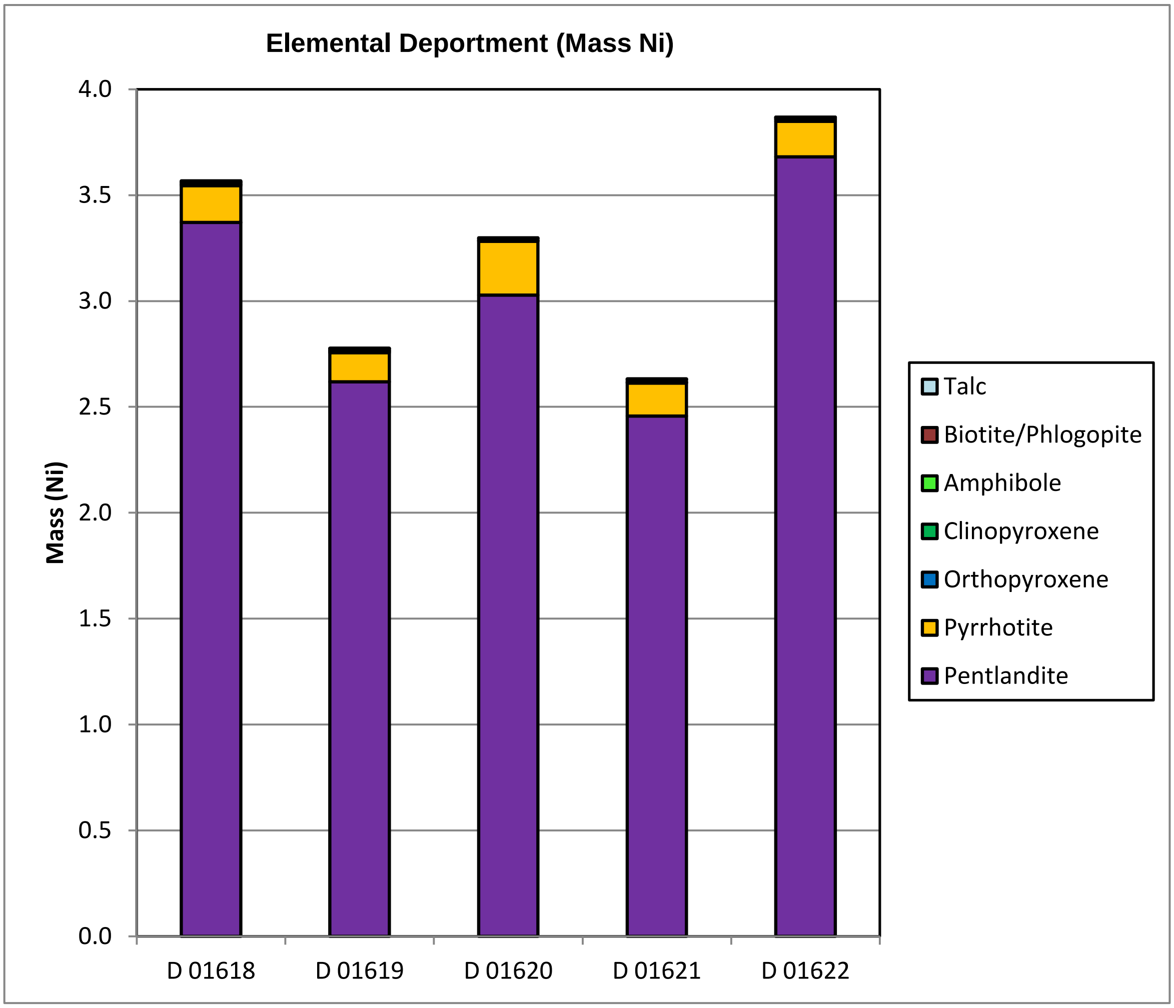
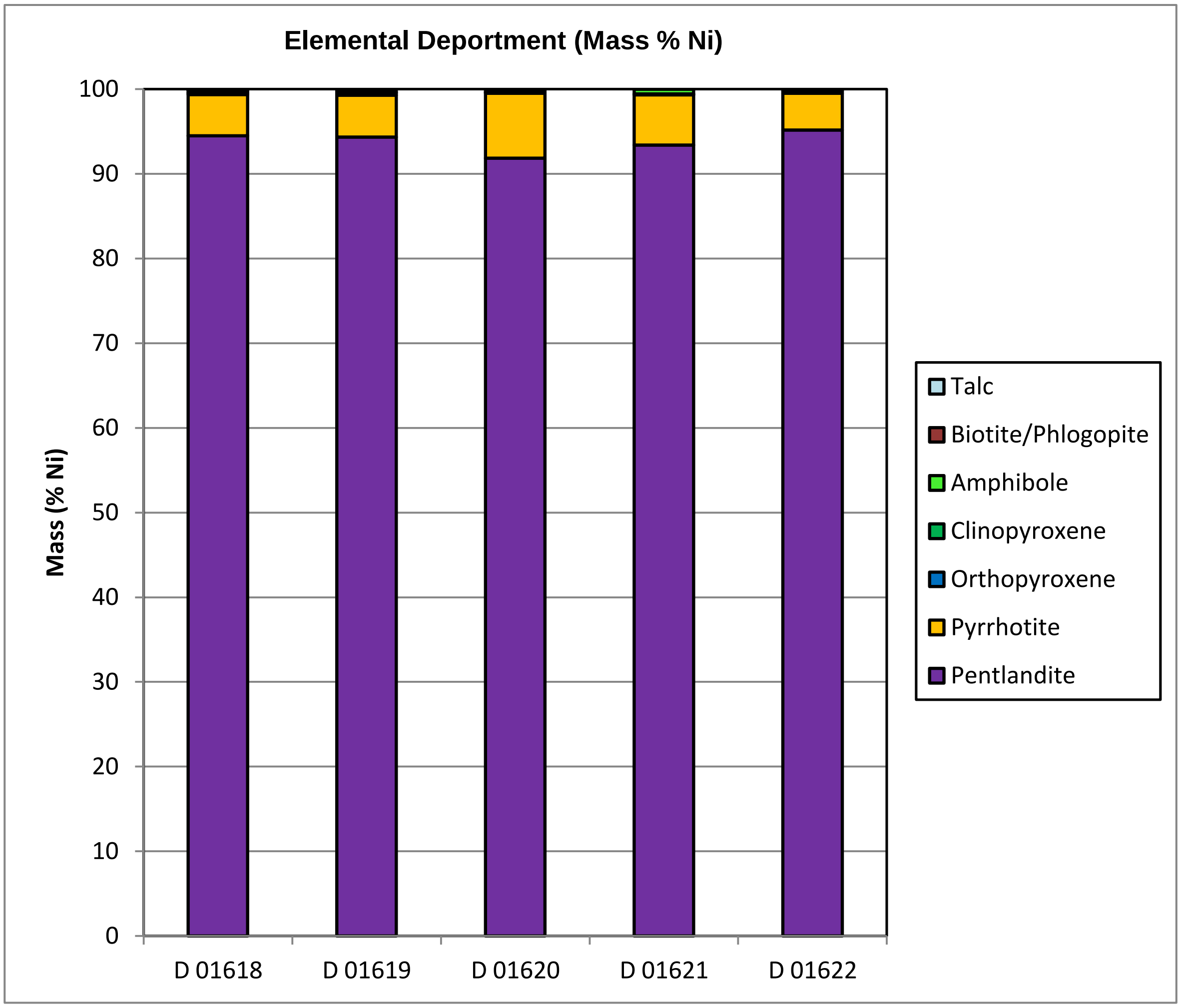
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Ni Deportment - Absolute**




| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pentlandite** | 3.37 | 2.62 | 3.03 | 2.46 | 3.68 |
| **Pyrrhotite** | 0.17 | 0.14 | 0.25 | 0.16 | 0.17 |
| **Orthopyroxene** | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| **Clinopyroxene** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Amphibole** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **Biotite/Phlogopite** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Talc** | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | 3.57 | 2.78 | 3.30 | 2.63 | 3.87 |

**Ni Deportment - Normalized**




| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pentlandite** | 94.5 | 94.4 | 91.9 | 93.4 | 95.2 |
| **Pyrrhotite** | 4.90 | 4.94 | 7.67 | 5.92 | 4.36 |
| **Orthopyroxene** | 0.15 | 0.25 | 0.10 | 0.08 | 0.22 |
| **Clinopyroxene** | 0.05 | 0.10 | 0.04 | 0.05 | 0.11 |
| **Amphibole** | 0.25 | 0.32 | 0.32 | 0.54 | 0.13 |
| **Biotite/Phlogopite** | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 |
| **Talc** | 0.17 | 0.01 | 0.01 | 0.01 | 0.02 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

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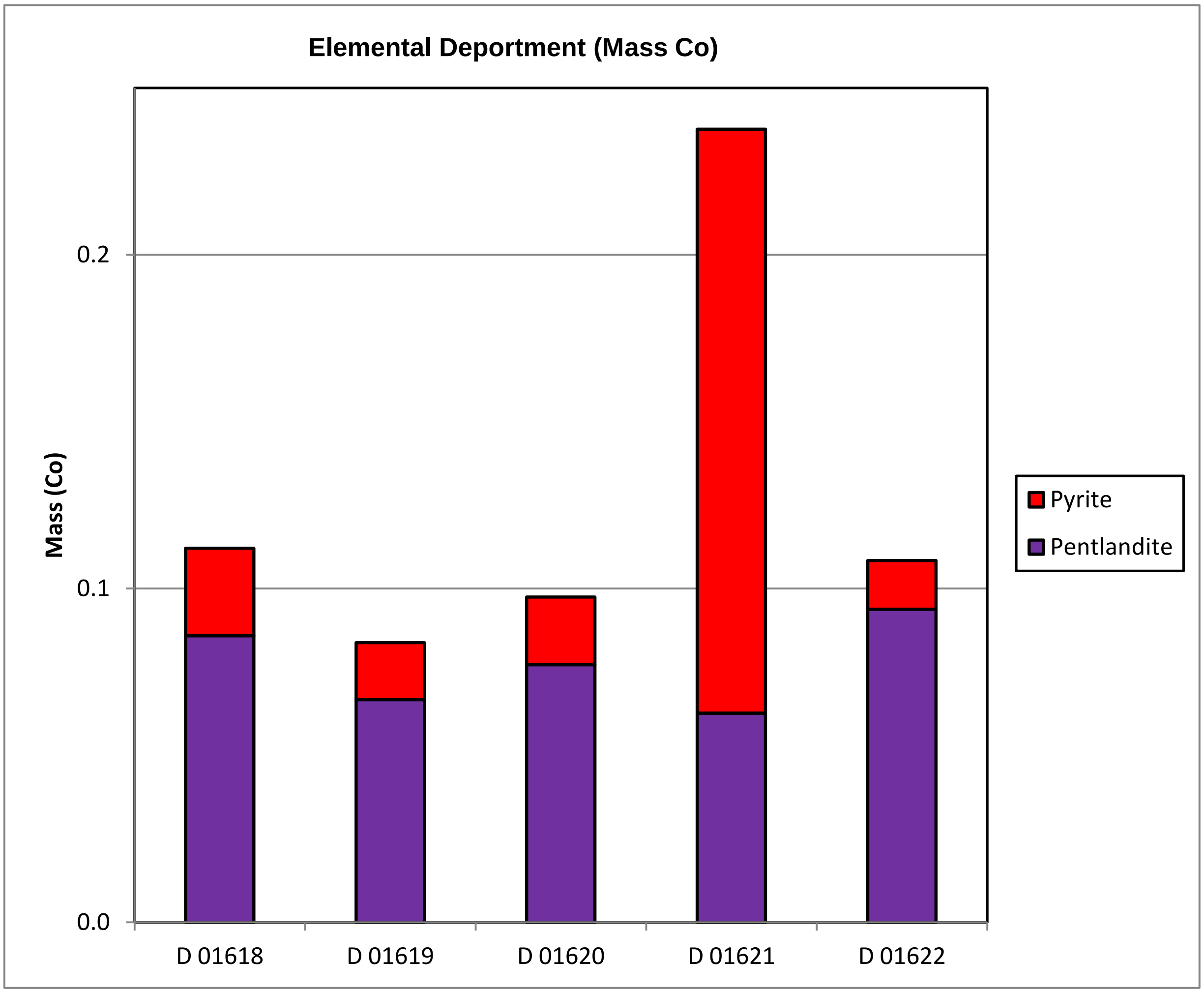
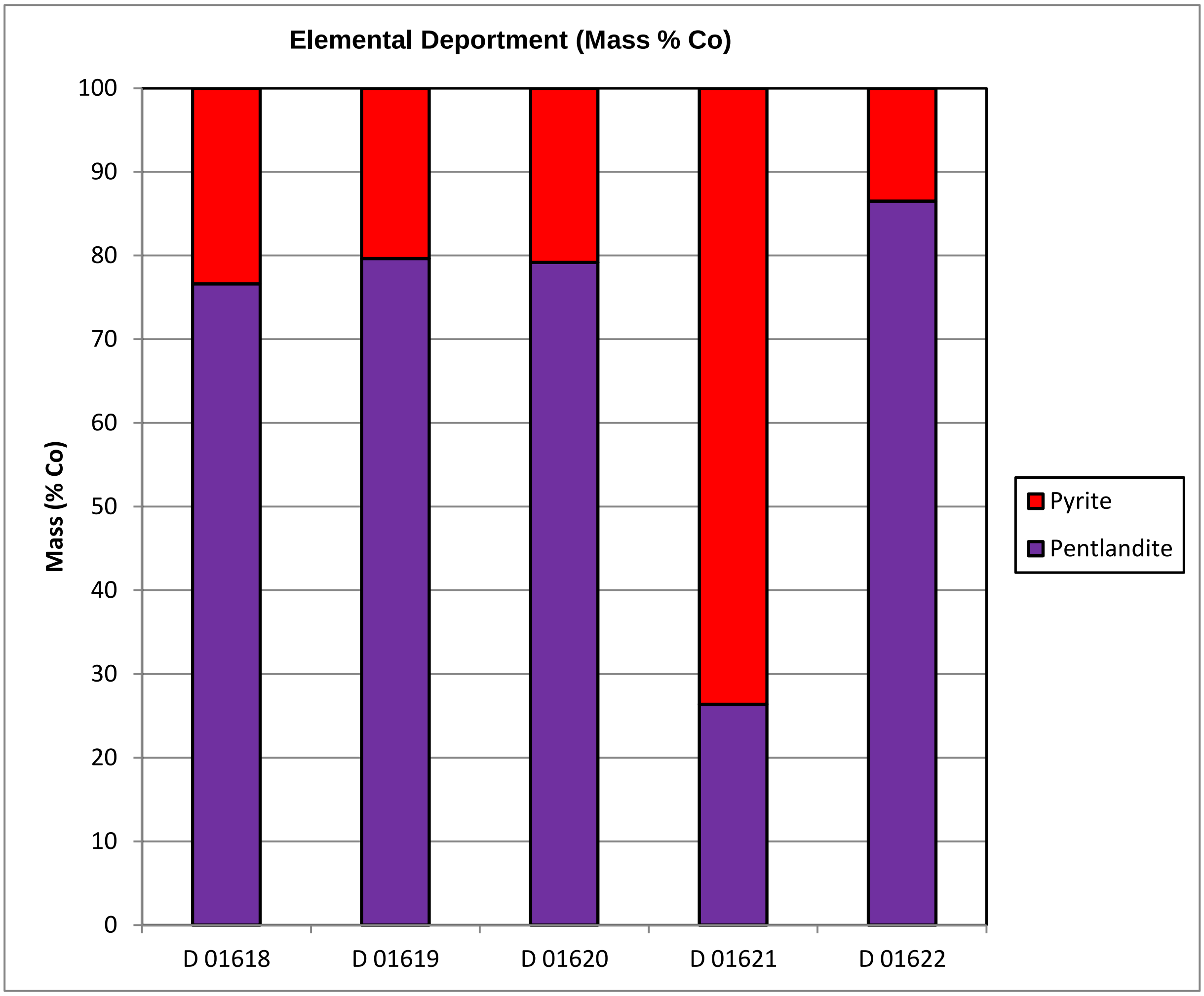
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Co Deportment - Absolute**




| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pentlandite** | 0.09 | 0.07 | 0.08 | 0.06 | 0.09 |
| **Pyrite** | 0.03 | 0.02 | 0.02 | 0.17 | 0.01 |
| **Total** | 0.11 | 0.08 | 0.10 | 0.24 | 0.11 |

**Co Deportment - Normalized**




| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Pentlandite | 76.6 | 79.6 | 79.2 | 26.4 | 86.5 |
| Pyrite | 23.4 | 20.4 | 20.8 | 73.6 | 13.5 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

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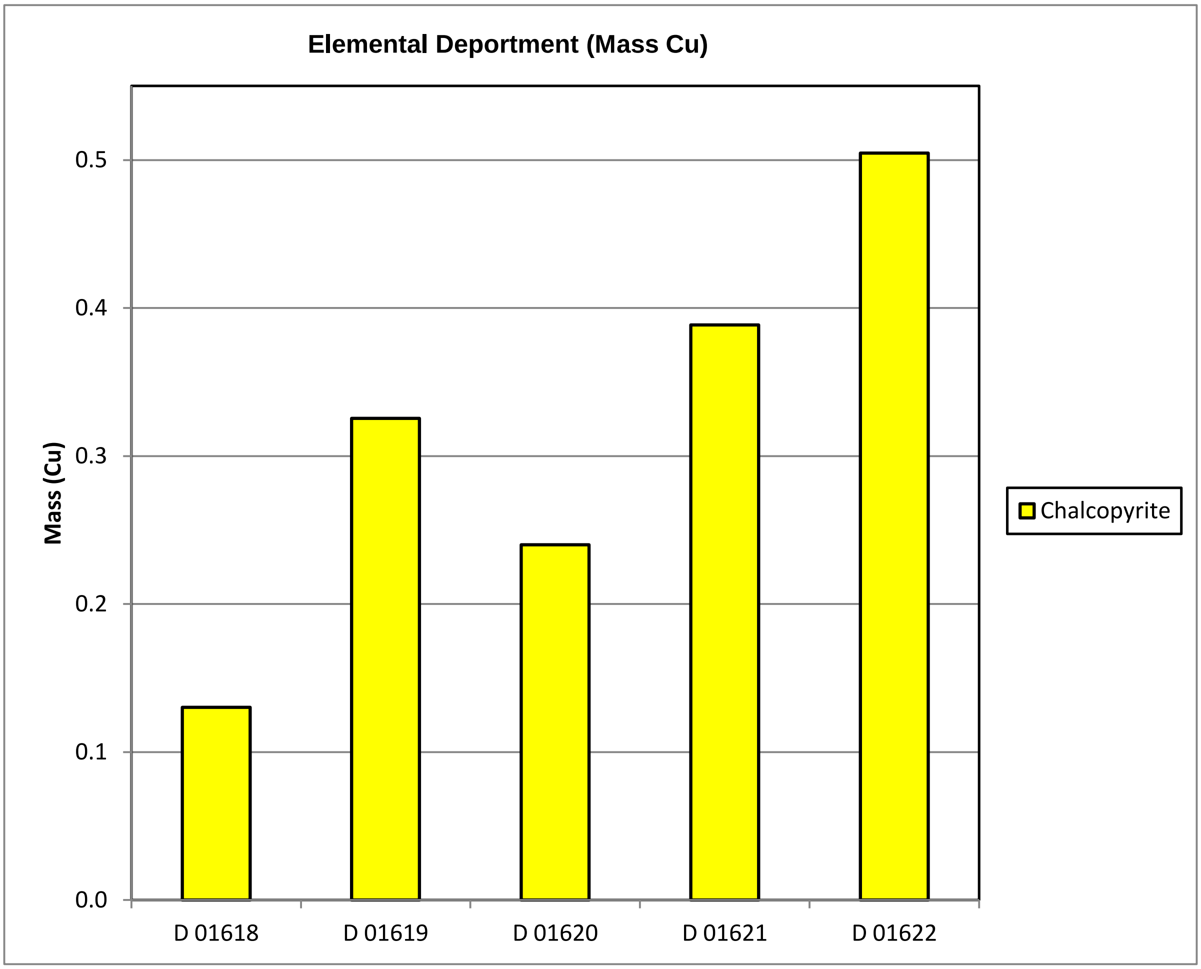
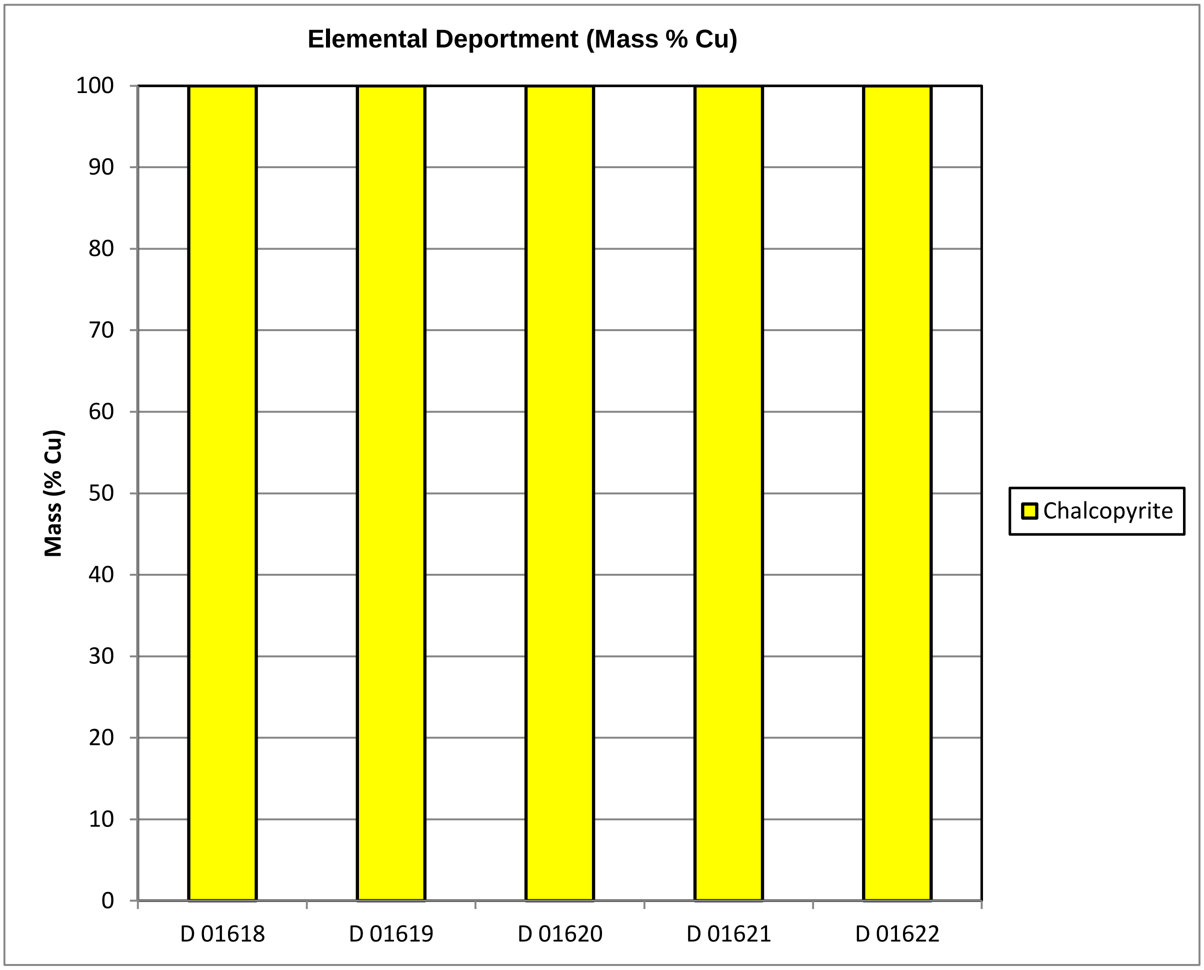
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Cu Deportment - Absolute**




| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Chalcopyrite** | 0.13 | 0.33 | 0.24 | 0.39 | 0.50 |
| **Total** | 0.13 | 0.33 | 0.24 | 0.39 | 0.50 |

**Cu Deportment - Normalized**




| Mineral | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Chalcopyrite** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

North American Nickel
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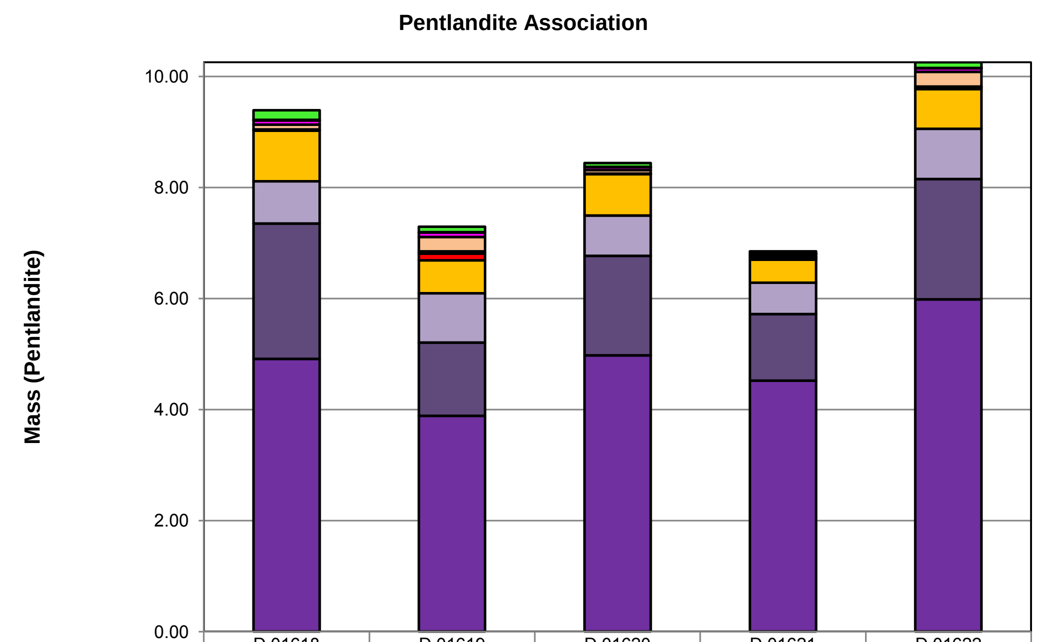
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

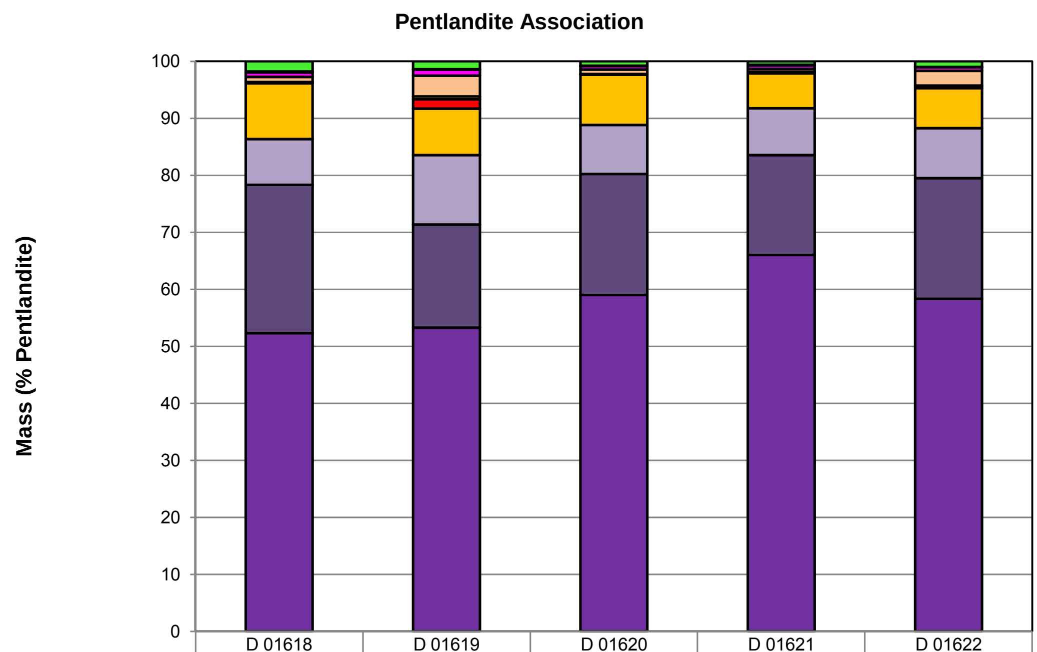
**Pentlandite Association**




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Complex | 0.17 | 0.10 | 0.07 | 0.04 | 0.10 |
| Pent:Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Carb | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 |
| Pent:Soft Silicates | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Hard Silicates | 0.07 | 0.08 | 0.05 | 0.04 | 0.07 |
| Pent:Cpy:Fe Sul | 0.09 | 0.26 | 0.06 | 0.03 | 0.26 |
| Pent:Cpy | 0.00 | 0.04 | 0.01 | 0.00 | 0.01 |
| Pent:Pyrite | 0.02 | 0.12 | 0.00 | 0.02 | 0.04 |
| Pent:Pyrrhotite | 0.92 | 0.59 | 0.75 | 0.42 | 0.72 |
| Lib Pent | 0.76 | 0.89 | 0.73 | 0.56 | 0.90 |
| Free Pent | 2.44 | 1.32 | 1.79 | 1.20 | 2.17 |
| Pure Pent | 4.91 | 3.89 | 4.98 | 4.52 | 5.98 |

**Absolute Mass of Pentlandite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Pent** | 4.91 | 3.89 | 4.98 | 4.52 | 5.98 |
| **Free Pent** | 2.44 | 1.32 | 1.79 | 1.20 | 2.17 |
| **Lib Pent** | 0.76 | 0.89 | 0.73 | 0.56 | 0.90 |
| **Pent:Pyrrhotite** | 0.92 | 0.59 | 0.75 | 0.42 | 0.72 |
| **Pent:Pyrite** | 0.02 | 0.12 | 0.00 | 0.02 | 0.04 |
| **Pent:Cpy** | 0.00 | 0.04 | 0.01 | 0.00 | 0.01 |
| **Pent:Cpy:Fe Sul** | 0.09 | 0.26 | 0.06 | 0.03 | 0.26 |
| **Pent:Hard Silicates** | 0.07 | 0.08 | 0.05 | 0.04 | 0.07 |
| **Pent:Soft Silicates** | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Pent:Carb** | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 |
| **Pent:Oxides** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Complex** | 0.17 | 0.10 | 0.07 | 0.04 | 0.10 |
| **Total** | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Complex | 1.82 | 1.38 | 0.79 | 0.62 | 1.01 |
| Pent:Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Carb | 0.08 | 0.08 | 0.03 | 0.10 | 0.01 |
| Pent:Soft Silicates | 0.06 | 0.01 | 0.02 | 0.00 | 0.03 |
| Pent:Hard Silicates | 0.77 | 1.07 | 0.64 | 0.65 | 0.65 |
| Pent:Cpy:Fe Sul | 0.93 | 3.60 | 0.74 | 0.47 | 2.57 |
| Pent:Cpy | 0.03 | 0.51 | 0.07 | 0.05 | 0.10 |
| Pent:Pyrite | 0.18 | 1.68 | 0.06 | 0.26 | 0.36 |
| Pent:Pyrrhotite | 9.75 | 8.15 | 8.83 | 6.09 | 6.99 |
| Lib Pent | 8.07 | 12.2 | 8.59 | 8.19 | 8.78 |
| Free Pent | 26.0 | 18.1 | 21.2 | 17.6 | 21.2 |
| Pure Pent | 52.3 | 53.3 | 59.0 | 66.0 | 58.3 |

**Normalized Mass of Pentlandite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Pent** | 52.3 | 53.3 | 59.0 | 66.0 | 58.3 |
| **Free Pent** | 26.0 | 18.1 | 21.2 | 17.6 | 21.2 |
| **Lib Pent** | 8.07 | 12.2 | 8.59 | 8.19 | 8.78 |
| **Pent:Pyrrhotite** | 9.75 | 8.15 | 8.83 | 6.09 | 6.99 |
| **Pent:Pyrite** | 0.18 | 1.68 | 0.06 | 0.26 | 0.36 |
| **Pent:Cpy** | 0.03 | 0.51 | 0.07 | 0.05 | 0.10 |
| **Pent:Cpy:Fe Sul** | 0.93 | 3.60 | 0.74 | 0.47 | 2.57 |
| **Pent:Hard Silicates** | 0.77 | 1.07 | 0.64 | 0.65 | 0.65 |
| **Pent:Soft Silicates** | 0.06 | 0.01 | 0.02 | 0.00 | 0.03 |
| **Pent:Carb** | 0.08 | 0.08 | 0.03 | 0.10 | 0.01 |
| **Pent:Oxides** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Complex** | 1.82 | 1.38 | 0.79 | 0.62 | 1.01 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Liberated** | **86.4** | **83.5** | **88.8** | **91.8** | **88.3** |
| **Expected Ni Misplacement** | **0.96** | **4.11** | **0.81** | **0.52** | **2.67** |

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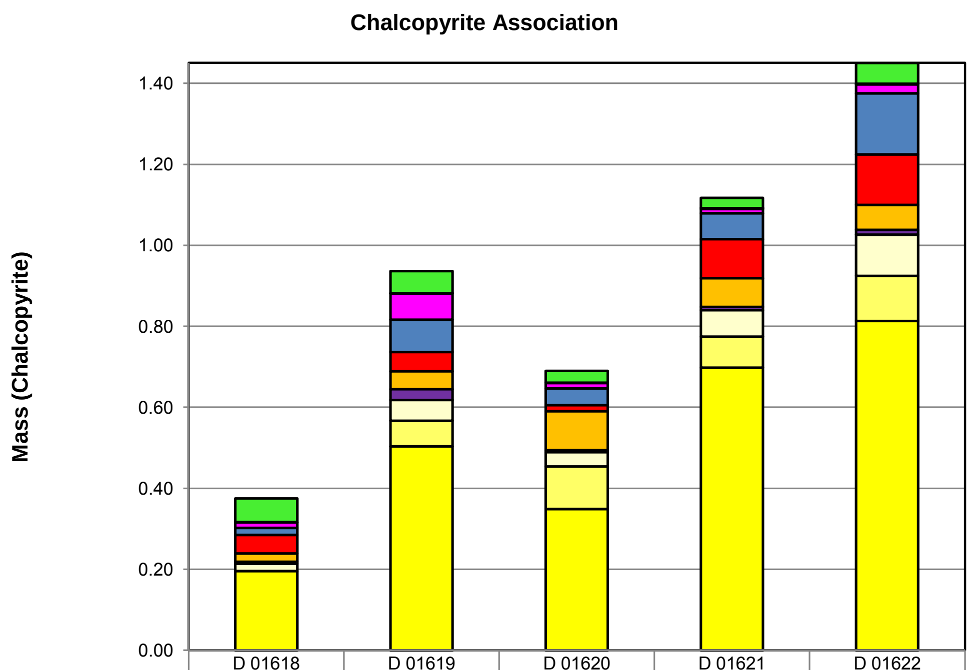
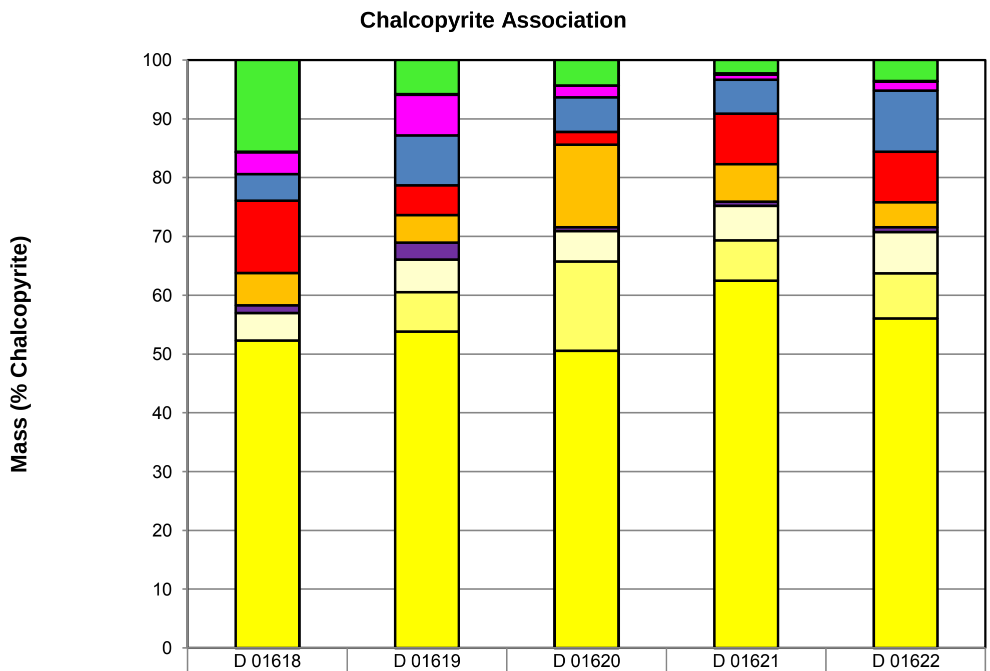
**Chalcopyrite Association**




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Complex | 0.06 | 0.05 | 0.03 | 0.03 | 0.05 |
| Cpy:Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Carb | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Soft Silicates | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Hard Silicates | 0.01 | 0.07 | 0.01 | 0.01 | 0.02 |
| Cpy:Fe S:Pent | 0.02 | 0.08 | 0.04 | 0.06 | 0.15 |
| Cpy:Pyrite | 0.05 | 0.05 | 0.01 | 0.10 | 0.12 |
| Cpy:Pyrrhotite | 0.02 | 0.04 | 0.10 | 0.07 | 0.06 |
| Cpy:Pentlandite | 0.00 | 0.03 | 0.00 | 0.01 | 0.01 |
| Lib Cpy | 0.02 | 0.05 | 0.04 | 0.07 | 0.10 |
| Free Cpy | 0.00 | 0.06 | 0.10 | 0.08 | 0.11 |
| Pure Cpy | 0.20 | 0.50 | 0.35 | 0.70 | 0.81 |

**Absolute Mass of Chalcopyrite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Cpy** | 0.20 | 0.50 | 0.35 | 0.70 | 0.81 |
| **Free Cpy** | 0.00 | 0.06 | 0.10 | 0.08 | 0.11 |
| **Lib Cpy** | 0.02 | 0.05 | 0.04 | 0.07 | 0.10 |
| **Cpy:Pentlandite** | 0.00 | 0.03 | 0.00 | 0.01 | 0.01 |
| **Cpy:Pyrrhotite** | 0.02 | 0.04 | 0.10 | 0.07 | 0.06 |
| **Cpy:Pyrite** | 0.05 | 0.05 | 0.01 | 0.10 | 0.12 |
| **Cpy:Fe S:Pent** | 0.02 | 0.08 | 0.04 | 0.06 | 0.15 |
| **Cpy:Hard Silicates** | 0.01 | 0.07 | 0.01 | 0.01 | 0.02 |
| **Cpy:Soft Silicates** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Cpy:Carb** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Cpy:Oxides** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Complex** | 0.06 | 0.05 | 0.03 | 0.03 | 0.05 |
| **Total** | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Complex | 15.6 | 5.81 | 4.31 | 2.29 | 3.58 |
| Cpy:Oxides | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| Cpy:Carb | 0.02 | 0.05 | 0.00 | 0.01 | 0.02 |
| Cpy:Soft Silicates | 0.05 | 0.02 | 0.01 | 0.21 | 0.07 |
| Cpy:Hard Silicates | 3.70 | 6.95 | 2.03 | 0.88 | 1.52 |
| Cpy:Fe S:Pent | 4.5 | 8.48 | 5.88 | 5.76 | 10.40 |
| Cpy:Pyrite | 12.3 | 5.08 | 2.15 | 8.61 | 8.60 |
| Cpy:Pyrrhotite | 5.5 | 4.69 | 14.04 | 6.35 | 4.26 |
| Cpy:Pentlandite | 1.3 | 2.84 | 0.66 | 0.69 | 0.78 |
| Lib Cpy | 4.69 | 5.56 | 5.17 | 5.87 | 7.02 |
| Free Cpy | 0.00 | 6.68 | 15.2 | 6.89 | 7.67 |
| Pure Cpy | 52.3 | 53.8 | 50.6 | 62.5 | 56.1 |

**Normalized Mass of Chalcopyrite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Cpy** | 52.3 | 53.8 | 50.6 | 62.5 | 56.1 |
| **Free Cpy** | 0.00 | 6.68 | 15.2 | 6.89 | 7.67 |
| **Lib Cpy** | 4.69 | 5.56 | 5.17 | 5.87 | 7.02 |
| **Cpy:Pentlandite** | 1.3 | 2.84 | 0.66 | 0.69 | 0.78 |
| **Cpy:Pyrrhotite** | 5.5 | 4.69 | 14.04 | 6.35 | 4.26 |
| **Cpy:Pyrite** | 12.3 | 5.08 | 2.15 | 8.61 | 8.60 |
| **Cpy:Fe S:Pent** | 4.5 | 8.48 | 5.88 | 5.76 | 10.40 |
| **Cpy:Hard Silicates** | 3.70 | 6.95 | 2.03 | 0.88 | 1.52 |
| **Cpy:Soft Silicates** | 0.05 | 0.02 | 0.01 | 0.21 | 0.07 |
| **Cpy:Carb** | 0.02 | 0.05 | 0.00 | 0.01 | 0.02 |
| **Cpy:Oxides** | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| **Complex** | 15.6 | 5.81 | 4.31 | 2.29 | 3.58 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Liberated** | **57.0** | **66.1** | **70.9** | **75.2** | **70.8** |
| **Expected Cu Recovery** | 80.6 | 87.2 | 93.6 | 96.6 | 94.8 |

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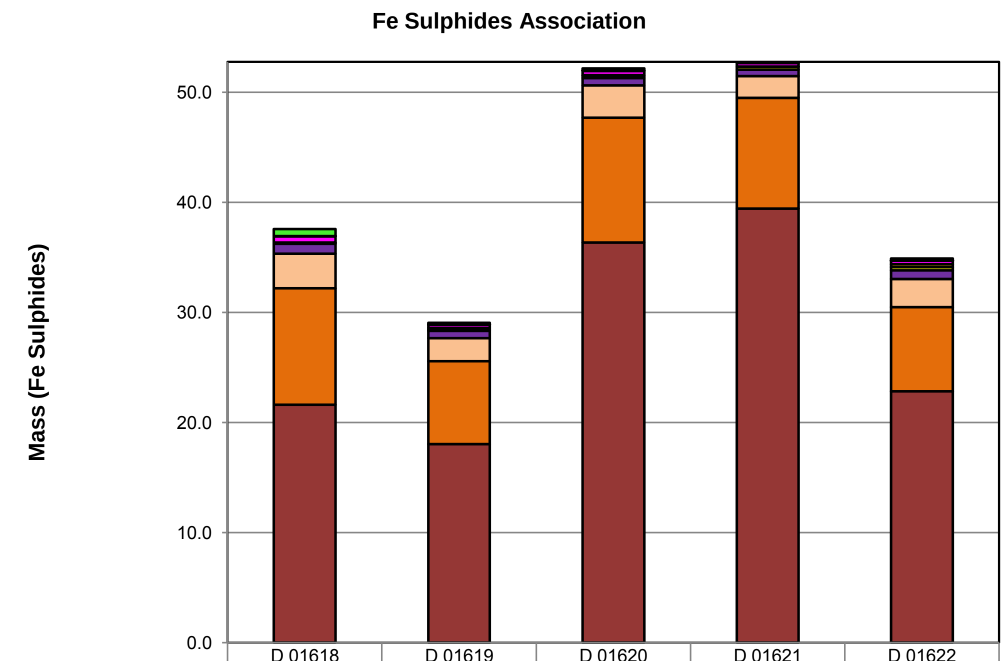
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

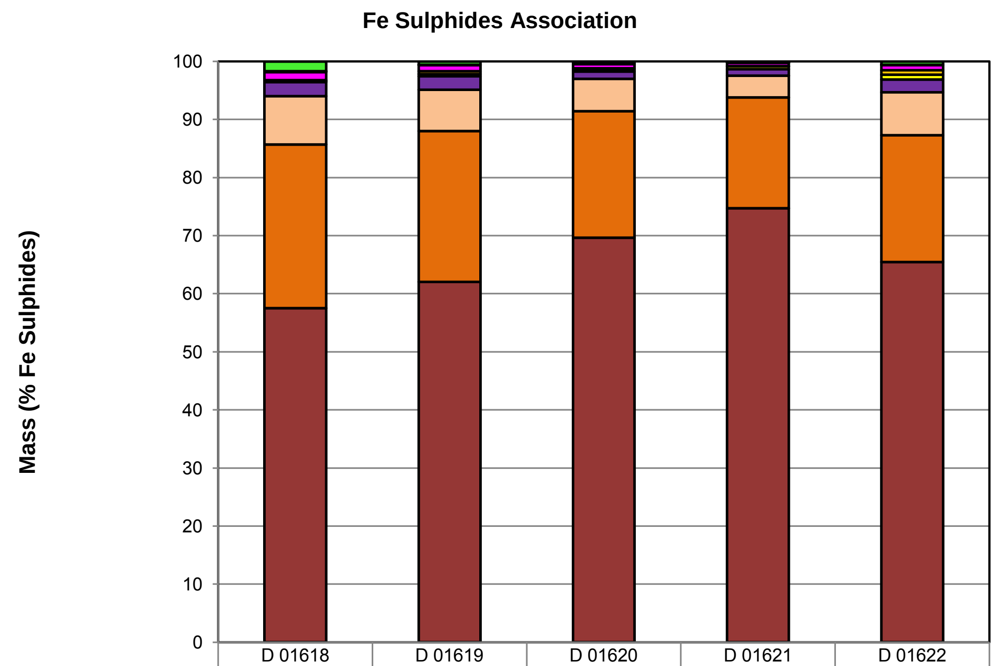
**Fe Sulphides Association**




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Complex | 0.64 | 0.17 | 0.20 | 0.11 | 0.20 |
| Fe Sul:Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fe Sul:Carb | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| Fe Sul:Soft Silicates | 0.03 | 0.00 | 0.01 | 0.00 | 0.00 |
| Fe Sul:Hard Silicates | 0.53 | 0.30 | 0.39 | 0.30 | 0.32 |
| Fe Sul:Cpy:Pent | 0.06 | 0.16 | 0.07 | 0.03 | 0.26 |
| Fe Sul:Cpy | 0.06 | 0.10 | 0.21 | 0.26 | 0.29 |
| Fe Sul:Pent | 0.91 | 0.68 | 0.66 | 0.59 | 0.77 |
| Lib Fe Sul | 3.14 | 2.07 | 2.92 | 1.98 | 2.57 |
| Free Fe Sul | 10.6 | 7.55 | 11.4 | 10.1 | 7.64 |
| Pure Fe Sul | 21.6 | 18.0 | 36.3 | 39.4 | 22.8 |

**Absolute Mass of Fe Sulphides Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Fe Sul** | 21.6 | 18.0 | 36.3 | 39.4 | 22.8 |
| **Free Fe Sul** | 10.6 | 7.55 | 11.4 | 10.1 | 7.64 |
| **Lib Fe Sul** | 3.14 | 2.07 | 2.92 | 1.98 | 2.57 |
| **Fe Sul:Pent** | 0.91 | 0.68 | 0.66 | 0.59 | 0.77 |
| **Fe Sul:Cpy** | 0.06 | 0.10 | 0.21 | 0.26 | 0.29 |
| **Fe Sul:Cpy:Pent** | 0.06 | 0.16 | 0.07 | 0.03 | 0.26 |
| **Fe Sul:Hard Silicates** | 0.53 | 0.30 | 0.39 | 0.30 | 0.32 |
| **Fe Sul:Soft Silicates** | 0.03 | 0.00 | 0.01 | 0.00 | 0.00 |
| **Fe Sul:Carb** | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 |
| **Fe Sul:Oxides** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Complex** | 0.64 | 0.17 | 0.20 | 0.11 | 0.20 |
| **Total** | 37.6 | 29.1 | 52.2 | 52.8 | 34.9 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Complex | 1.69 | 0.60 | 0.39 | 0.22 | 0.58 |
| Fe Sul:Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| Fe Sul:Carb | 0.04 | 0.02 | 0.03 | 0.02 | 0.02 |
| Fe Sul:Soft Silicates | 0.08 | 0.01 | 0.02 | 0.00 | 0.01 |
| Fe Sul:Hard Silicates | 1.42 | 1.03 | 0.74 | 0.56 | 0.92 |
| Fe Sul:Cpy:Pent | 0.15 | 0.53 | 0.13 | 0.06 | 0.75 |
| Fe Sul:Cpy | 0.17 | 0.35 | 0.40 | 0.49 | 0.83 |
| Fe Sul:Pent | 2.42 | 2.32 | 1.27 | 1.12 | 2.21 |
| Lib Fe Sul | 8.36 | 7.13 | 5.60 | 3.76 | 7.37 |
| Free Fe Sul | 28.1 | 26.0 | 21.8 | 19.1 | 21.9 |
| Pure Fe Sul | 57.5 | 62.0 | 69.6 | 74.7 | 65.4 |

**Normalized Mass of Fe Sulphides Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Fe Sul** | 57.5 | 62.0 | 69.6 | 74.7 | 65.4 |
| **Free Fe Sul** | 28.1 | 26.0 | 21.8 | 19.1 | 21.9 |
| **Lib Fe Sul** | 8.36 | 7.13 | 5.60 | 3.76 | 7.37 |
| **Fe Sul:Pent** | 2.42 | 2.32 | 1.27 | 1.12 | 2.21 |
| **Fe Sul:Cpy** | 0.17 | 0.35 | 0.40 | 0.49 | 0.83 |
| **Fe Sul:Cpy:Pent** | 0.15 | 0.53 | 0.13 | 0.06 | 0.75 |
| **Fe Sul:Hard Silicates** | 1.42 | 1.03 | 0.74 | 0.56 | 0.92 |
| **Fe Sul:Soft Silicates** | 0.08 | 0.01 | 0.02 | 0.00 | 0.01 |
| **Fe Sul:Carb** | 0.04 | 0.02 | 0.03 | 0.02 | 0.02 |
| **Fe Sul:Oxides** | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| **Complex** | 1.69 | 0.60 | 0.39 | 0.22 | 0.58 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Liberated** | **94.0** | **95.1** | **97.0** | **97.5** | **94.7** |

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**Association Summary**

| Mineral | Liberated/Associaton | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Pentlandite | Liberated | 86.4 | 83.5 | 88.8 | 91.8 | 88.3 |
| | Fe Sulphides | 9.93 | 9.83 | 8.89 | 6.35 | 7.35 |
| | Chalcopyrite | 0.03 | 0.51 | 0.07 | 0.05 | 0.10 |
| | Chalcopyrite:Fe Sulphide | 0.93 | 3.60 | 0.74 | 0.47 | 2.57 |
| | Hard Silicates | 0.77 | 1.07 | 0.64 | 0.65 | 0.65 |
| | Soft Silicates | 0.06 | 0.01 | 0.02 | 0.00 | 0.03 |
| | Carbonates | 0.08 | 0.08 | 0.03 | 0.10 | 0.01 |
| | Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Complex | 1.82 | 1.38 | 0.79 | 0.62 | 1.01 |
| Chalcopyrite | Liberated | 57.0 | 66.1 | 70.9 | 75.2 | 70.8 |
| | Fe Sulphides | 17.8 | 9.77 | 16.2 | 15.0 | 12.9 |
| | Pentlandite | 1.29 | 2.84 | 0.66 | 0.69 | 0.78 |
| | Fe Sulphide:Pentlandite | 4.55 | 8.48 | 5.88 | 5.76 | 10.4 |
| | Hard Silicates | 3.70 | 6.95 | 2.03 | 0.88 | 1.52 |
| | Soft Silicates | 0.05 | 0.02 | 0.01 | 0.21 | 0.07 |
| | Carbonates | 0.02 | 0.05 | 0.00 | 0.01 | 0.02 |
| | Oxides | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| | Complex | 15.6 | 5.81 | 4.31 | 2.29 | 3.58 |
| Fe Sulphides | Liberated | 94.0 | 95.1 | 97.0 | 97.5 | 94.7 |
| | Pentlandite | 2.42 | 2.32 | 1.27 | 1.12 | 2.21 |
| | Chalcopyrite | 0.17 | 0.35 | 0.40 | 0.49 | 0.83 |
| | Chalcopyrite:Pentlandite | 0.15 | 0.53 | 0.13 | 0.06 | 0.75 |
| | Hard Silicates | 1.42 | 1.03 | 0.74 | 0.56 | 0.92 |
| | Soft Silicates | 0.08 | 0.01 | 0.02 | 0.00 | 0.01 |
| | Carbonates | 0.04 | 0.02 | 0.03 | 0.02 | 0.02 |
| | Oxides | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| | Complex | 1.69 | 0.60 | 0.39 | 0.22 | 0.58 |

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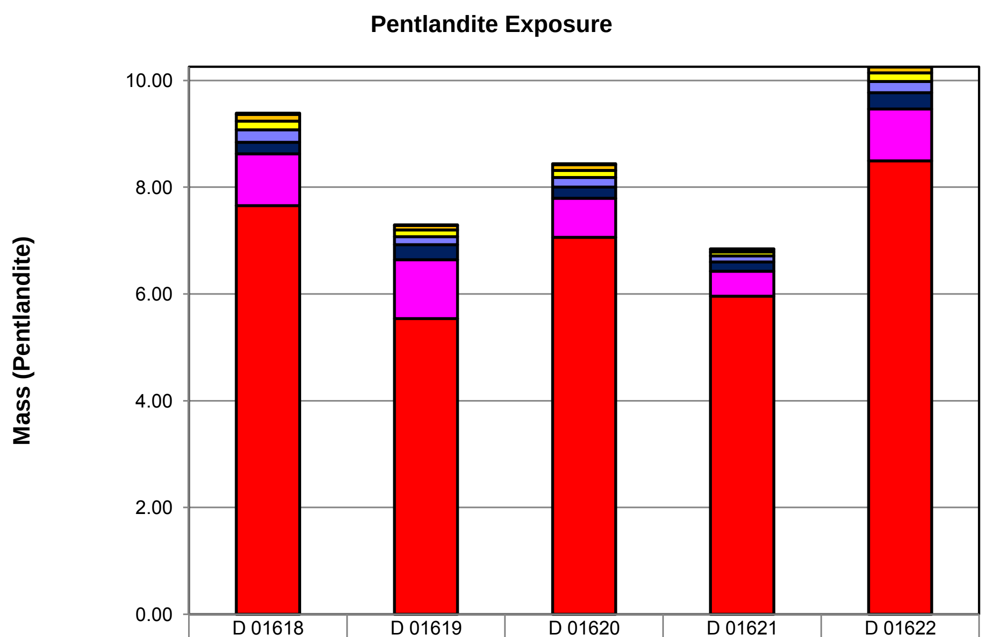
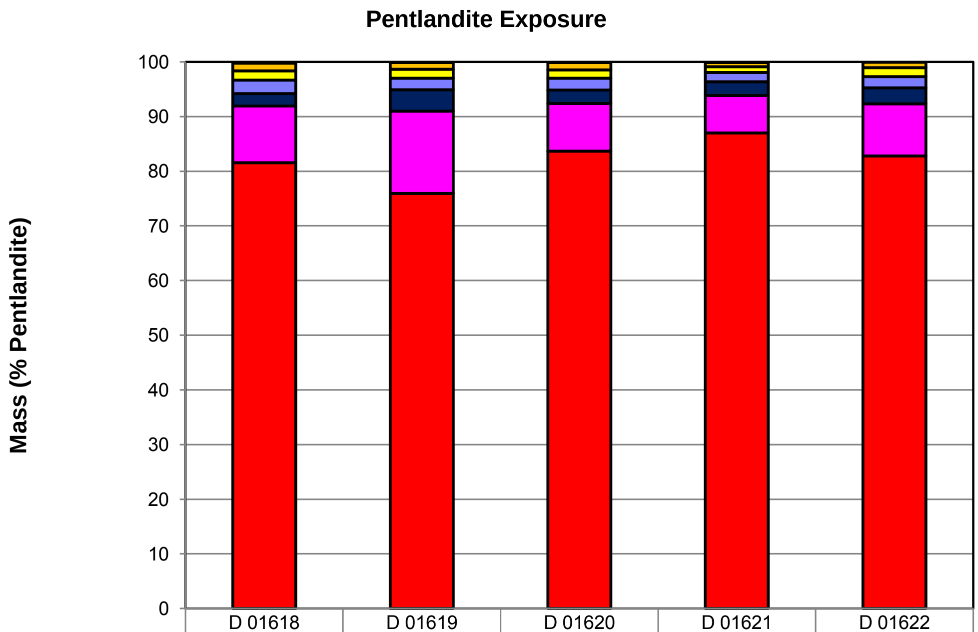
**Pentlandite Exposure**




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Locked | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 |
| 0-10% Exposed | 0.13 | 0.09 | 0.11 | 0.05 | 0.10 |
| 10-20% Exposed | 0.16 | 0.12 | 0.13 | 0.07 | 0.16 |
| 20-30% Exposed | 0.23 | 0.15 | 0.18 | 0.11 | 0.21 |
| 30-50% Exposed | 0.21 | 0.28 | 0.21 | 0.17 | 0.30 |
| 50-80% Exposed | 0.97 | 1.10 | 0.73 | 0.47 | 0.97 |
| Exposed | 7.66 | 5.54 | 7.06 | 5.96 | 8.49 |

**Absolute Mass of Pentlandite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Exposed** | 7.66 | 5.54 | 7.06 | 5.96 | 8.49 |
| **50-80% Exposed** | 0.97 | 1.10 | 0.73 | 0.47 | 0.97 |
| **30-50% Exposed** | 0.21 | 0.28 | 0.21 | 0.17 | 0.30 |
| **20-30% Exposed** | 0.23 | 0.15 | 0.18 | 0.11 | 0.21 |
| **10-20% Exposed** | 0.16 | 0.12 | 0.13 | 0.07 | 0.16 |
| **0-10% Exposed** | 0.13 | 0.09 | 0.11 | 0.05 | 0.10 |
| **Locked** | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 |
| **Total** | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Locked | 0.25 | 0.14 | 0.15 | 0.11 | 0.08 |
| 0-10% Exposed | 1.37 | 1.19 | 1.31 | 0.78 | 1.00 |
| 10-20% Exposed | 1.72 | 1.67 | 1.55 | 1.07 | 1.60 |
| 20-30% Exposed | 2.48 | 2.09 | 2.14 | 1.67 | 2.05 |
| 30-50% Exposed | 2.27 | 3.90 | 2.48 | 2.51 | 2.97 |
| 50-80% Exposed | 10.3 | 15.1 | 8.68 | 6.86 | 9.50 |
| Exposed | 81.6 | 75.9 | 83.7 | 87.0 | 82.8 |

**Normalized Mass of Pentlandite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Exposed** | 81.6 | 75.9 | 83.7 | 87.0 | 82.8 |
| **50-80% Exposed** | 10.3 | 15.1 | 8.68 | 6.86 | 9.50 |
| **30-50% Exposed** | 2.27 | 3.90 | 2.48 | 2.51 | 2.97 |
| **20-30% Exposed** | 2.48 | 2.09 | 2.14 | 1.67 | 2.05 |
| **10-20% Exposed** | 1.72 | 1.67 | 1.55 | 1.07 | 1.60 |
| **0-10% Exposed** | 1.37 | 1.19 | 1.31 | 0.78 | 1.00 |
| **Locked** | 0.25 | 0.14 | 0.15 | 0.11 | 0.08 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **>20% Exposed** | **96.7** | **97.0** | **97.0** | **98.0** | **97.3** |

North American Nickel
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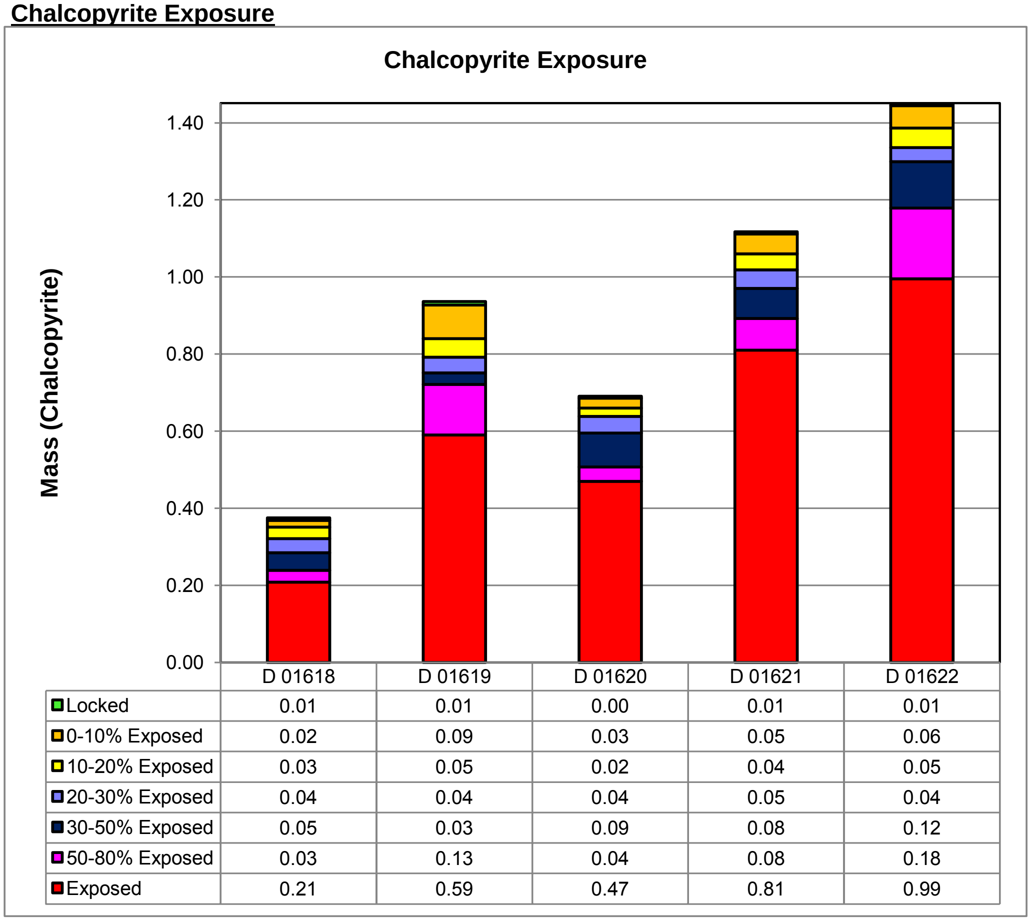
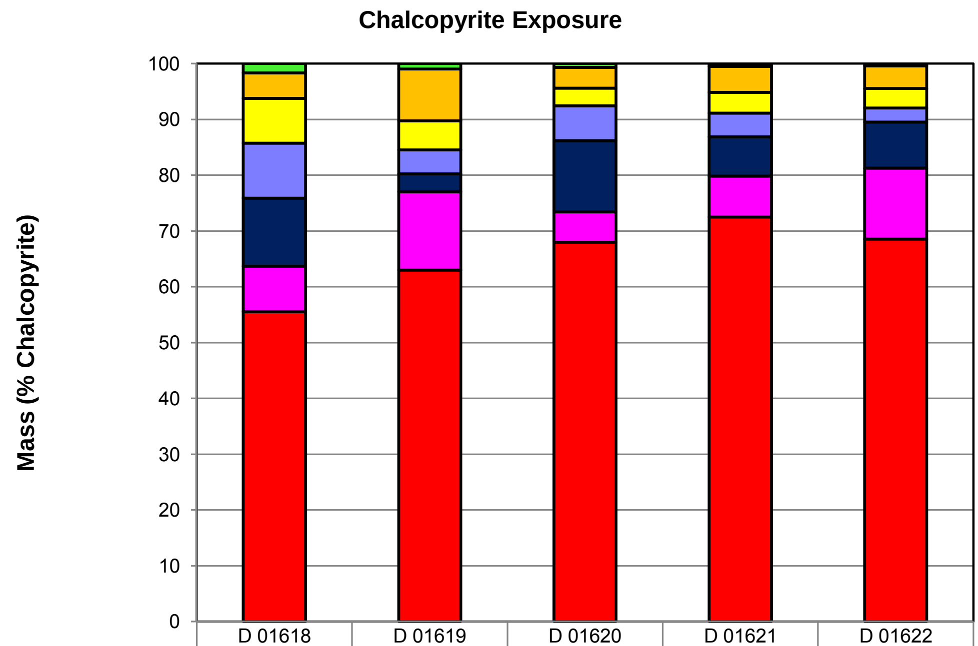
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Chalcopyrite Exposure**




**Absolute Mass of Chalcopyrite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Exposed** | 0.21 | 0.59 | 0.47 | 0.81 | 0.99 |
| **50-80% Exposed** | 0.03 | 0.13 | 0.04 | 0.08 | 0.18 |
| **30-50% Exposed** | 0.05 | 0.03 | 0.09 | 0.08 | 0.12 |
| **20-30% Exposed** | 0.04 | 0.04 | 0.04 | 0.05 | 0.04 |
| **10-20% Exposed** | 0.03 | 0.05 | 0.02 | 0.04 | 0.05 |
| **0-10% Exposed** | 0.02 | 0.09 | 0.03 | 0.05 | 0.06 |
| **Locked** | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| **Total** | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Locked | 1.65 | 0.95 | 0.68 | 0.48 | 0.41 |
| 0-10% Exposed | 4.60 | 9.32 | 3.73 | 4.65 | 4.02 |
| 10-20% Exposed | 7.98 | 5.16 | 3.13 | 3.74 | 3.53 |
| 20-30% Exposed | 9.88 | 4.34 | 6.25 | 4.26 | 2.51 |
| 30-50% Exposed | 12.2 | 3.19 | 12.8 | 7.04 | 8.27 |
| 50-80% Exposed | 8.16 | 14.0 | 5.46 | 7.35 | 12.7 |
| Exposed | 55.5 | 63.0 | 68.0 | 72.5 | 68.6 |

**Normalized Mass of Chalcopyrite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Exposed** | 55.5 | 63.0 | 68.0 | 72.5 | 68.6 |
| **50-80% Exposed** | 8.16 | 14.0 | 5.46 | 7.35 | 12.7 |
| **30-50% Exposed** | 12.2 | 3.19 | 12.8 | 7.04 | 8.27 |
| **20-30% Exposed** | 9.88 | 4.34 | 6.25 | 4.26 | 2.51 |
| **10-20% Exposed** | 7.98 | 5.16 | 3.13 | 3.74 | 3.53 |
| **0-10% Exposed** | 4.60 | 9.32 | 3.73 | 4.65 | 4.02 |
| **Locked** | 1.65 | 0.95 | 0.68 | 0.48 | 0.41 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **>20% Exposed** | **85.8** | **84.6** | **92.5** | **91.1** | **92.0** |

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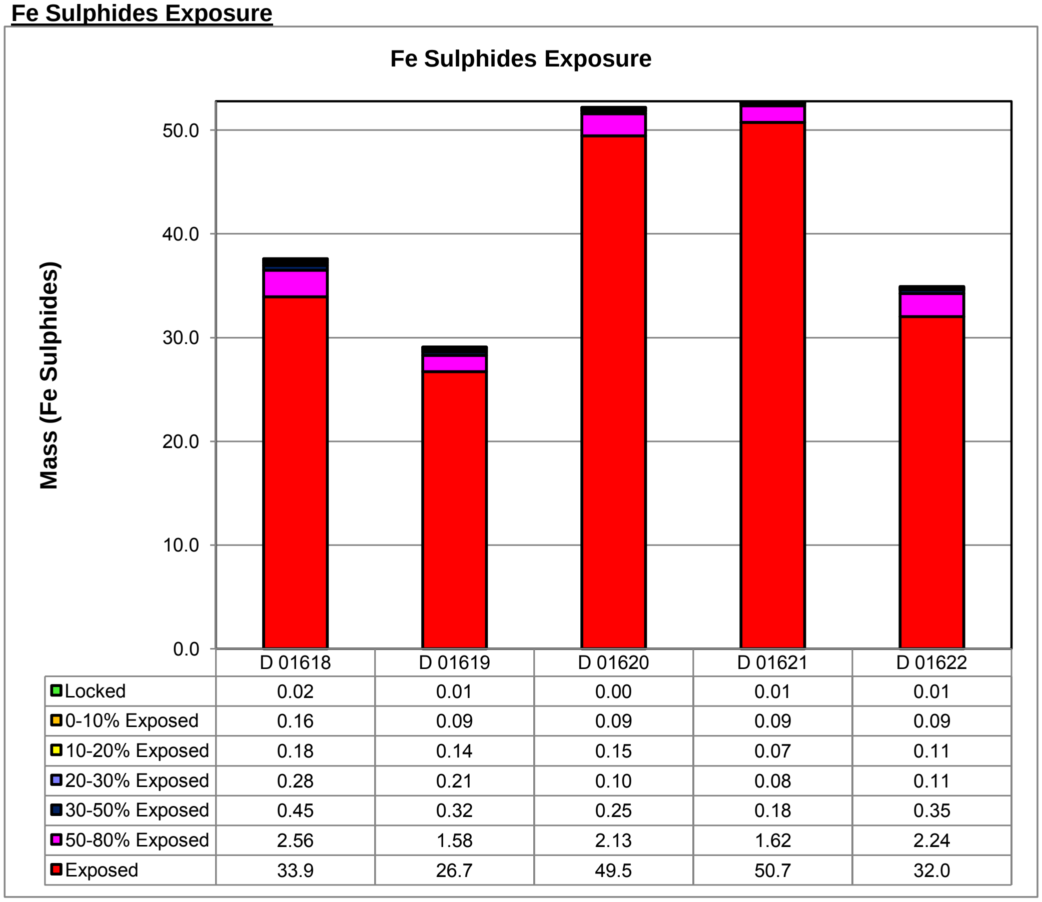
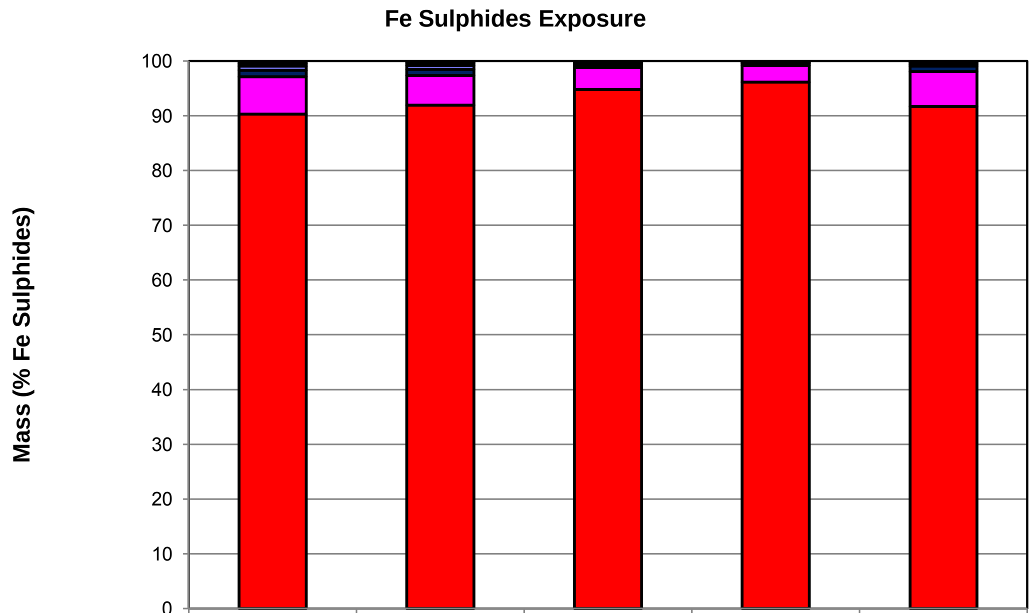
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Fe Sulphides Exposure**




**Absolute Mass of Fe Sulphides Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Exposed** | 33.9 | 26.7 | 49.5 | 50.7 | 32.0 |
| **50-80% Exposed** | 2.56 | 1.58 | 2.13 | 1.62 | 2.24 |
| **30-50% Exposed** | 0.45 | 0.32 | 0.25 | 0.18 | 0.35 |
| **20-30% Exposed** | 0.28 | 0.21 | 0.10 | 0.08 | 0.11 |
| **10-20% Exposed** | 0.18 | 0.14 | 0.15 | 0.07 | 0.11 |
| **0-10% Exposed** | 0.16 | 0.09 | 0.09 | 0.09 | 0.09 |
| **Locked** | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 |
| **Total** | 37.6 | 29.1 | 52.2 | 52.8 | 34.9 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Locked | 0.05 | 0.02 | 0.01 | 0.01 | 0.02 |
| 0-10% Exposed | 0.42 | 0.30 | 0.17 | 0.16 | 0.25 |
| 10-20% Exposed | 0.48 | 0.50 | 0.29 | 0.13 | 0.31 |
| 20-30% Exposed | 0.74 | 0.71 | 0.19 | 0.16 | 0.32 |
| 30-50% Exposed | 1.19 | 1.12 | 0.48 | 0.35 | 1.00 |
| 50-80% Exposed | 6.81 | 5.43 | 4.08 | 3.07 | 6.42 |
| Exposed | 90.3 | 91.9 | 94.8 | 96.1 | 91.7 |

**Normalized Mass of Fe Sulphides Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Exposed** | 90.3 | 91.9 | 94.8 | 96.1 | 91.7 |
| **50-80% Exposed** | 6.81 | 5.43 | 4.08 | 3.07 | 6.42 |
| **30-50% Exposed** | 1.19 | 1.12 | 0.48 | 0.35 | 1.00 |
| **20-30% Exposed** | 0.74 | 0.71 | 0.19 | 0.16 | 0.32 |
| **10-20% Exposed** | 0.48 | 0.50 | 0.29 | 0.13 | 0.31 |
| **0-10% Exposed** | 0.42 | 0.30 | 0.17 | 0.16 | 0.25 |
| **Locked** | 0.05 | 0.02 | 0.01 | 0.01 | 0.02 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **>20% Exposed** | **99.1** | **99.2** | **99.5** | **99.7** | **99.4** |

North American Nickel
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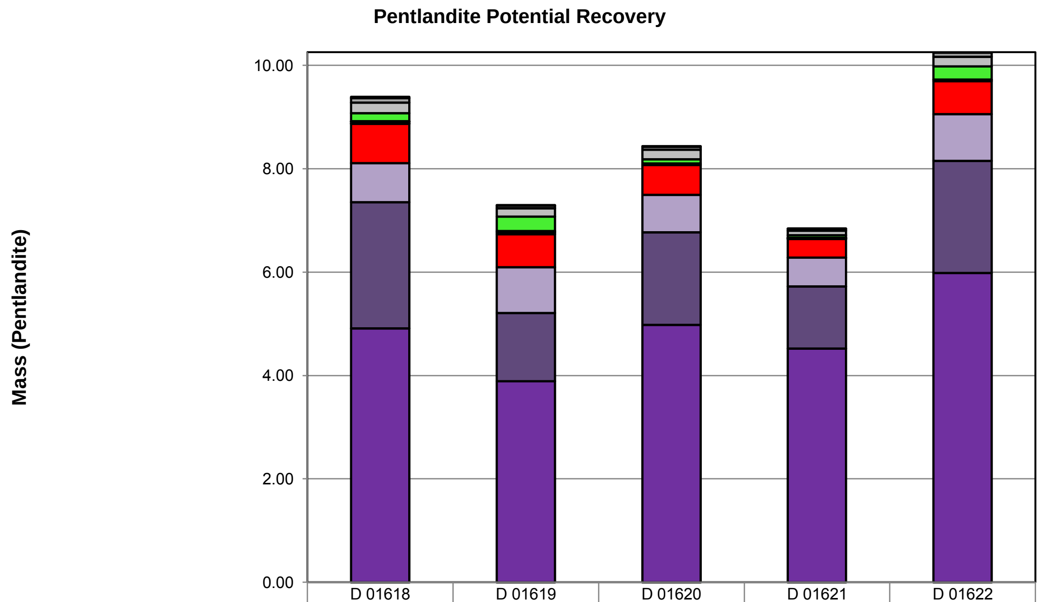
**Exposure Summary**

| Mineral | Exposure | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|---|
| Pentlandite | Exposed | 81.6 | 75.9 | 83.7 | 87.0 | 82.8 |
| | 0-80% Exposed | 18.2 | 23.9 | 16.2 | 12.9 | 17.1 |
| | Locked | 0.25 | 0.14 | 0.15 | 0.11 | 0.08 |
| Chalcopyrite | Exposed | 55.5 | 63.0 | 68.0 | 72.5 | 68.6 |
| | 0-80% Exposed | 42.8 | 36.0 | 31.3 | 27.0 | 31.0 |
| | Locked | 1.65 | 0.95 | 0.68 | 0.48 | 0.41 |
| Fe Sulphides | Exposed | 90.3 | 91.9 | 94.8 | 96.1 | 91.7 |
| | 0-80% Exposed | 9.64 | 8.06 | 5.21 | 3.86 | 8.30 |
| | Locked | 0.05 | 0.02 | 0.01 | 0.01 | 0.02 |

North American Nickel
CAVM-14021-103
MI7011-OCT15

*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

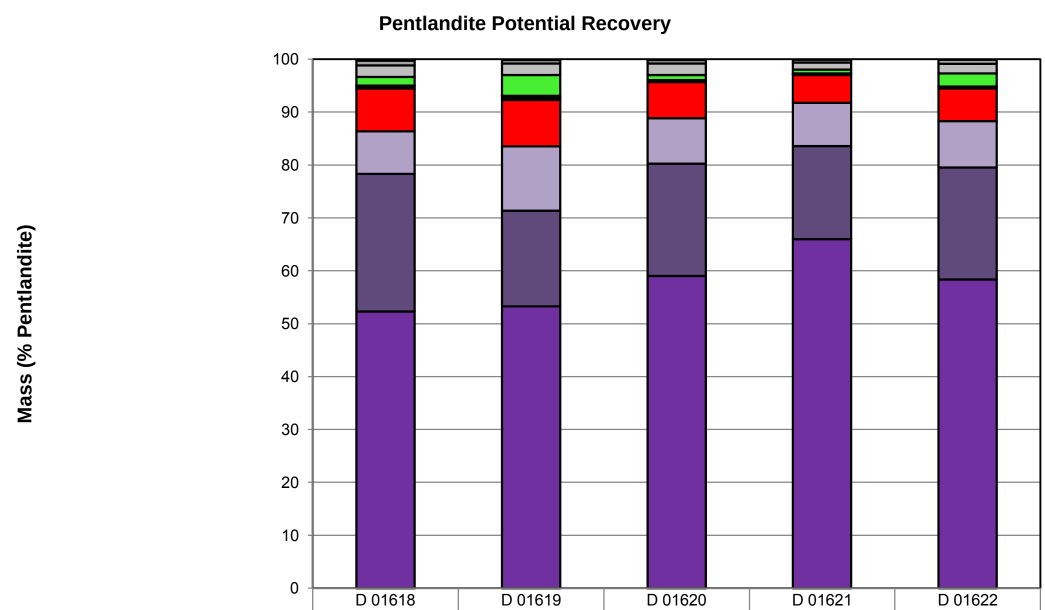
**Pentlandite Potential Recovery**




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Non Recoverable - Locked | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 |
| Non Recoverable - Exposed | 0.08 | 0.05 | 0.06 | 0.04 | 0.08 |
| Pent:Fe Sul <20% Exp/Lkd (Non Rec) | 0.21 | 0.16 | 0.18 | 0.09 | 0.19 |
| Recoverable - Complex Grains | 0.16 | 0.28 | 0.08 | 0.05 | 0.26 |
| Pent:Oxides (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Carbonates (Rec) | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Pent:Soft Silicates (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Hard Silicates (Rec) | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 |
| Pentlandite:Chalcopyrite (Rec) | 0.00 | 0.03 | 0.01 | 0.00 | 0.00 |
| Pent:Fe Sul >20% Exp (Rec) | 0.76 | 0.64 | 0.58 | 0.36 | 0.64 |
| Lib Pentlandite | 0.76 | 0.89 | 0.73 | 0.56 | 0.90 |
| Free Pentlandite | 2.44 | 1.32 | 1.79 | 1.20 | 2.17 |
| Pure Pentlandite | 4.91 | 3.89 | 4.98 | 4.52 | 5.98 |

**Absolute Mass of Pentlandite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Pure Pentlandite | 4.91 | 3.89 | 4.98 | 4.52 | 5.98 |
| Free Pentlandite | 2.44 | 1.32 | 1.79 | 1.20 | 2.17 |
| Lib Pentlandite | 0.76 | 0.89 | 0.73 | 0.56 | 0.90 |
| Pent:Fe Sul >20% Exp (Rec) | 0.76 | 0.64 | 0.58 | 0.36 | 0.64 |
| Pentlandite:Chalcopyrite (Rec) | 0.00 | 0.03 | 0.01 | 0.00 | 0.00 |
| Pent:Hard Silicates (Rec) | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 |
| Pent:Soft Silicates (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Carbonates (Rec) | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 |
| Pent:Oxides (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Recoverable - Complex Grains | 0.16 | 0.28 | 0.08 | 0.05 | 0.26 |
| Pent:Fe Sul <20% Exp/Lkd (Non Rec) | 0.21 | 0.16 | 0.18 | 0.09 | 0.19 |
| Non Recoverable - Exposed | 0.08 | 0.05 | 0.06 | 0.04 | 0.08 |
| Non Recoverable - Locked | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 |
| Total | 9.39 | 7.30 | 8.44 | 6.85 | 10.3 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Non Recoverable - Locked | 0.25 | 0.14 | 0.15 | 0.11 | 0.08 |
| Non Recoverable - Exposed | 0.90 | 0.70 | 0.68 | 0.54 | 0.78 |
| Pent:Fe Sul <20% Exp/Lkd (Non Rec) | 2.19 | 2.17 | 2.18 | 1.31 | 1.82 |
| Recoverable - Complex Grains | 1.67 | 3.90 | 0.97 | 0.72 | 2.52 |
| Pent:Oxides (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pent:Carbonates (Rec) | 0.08 | 0.07 | 0.02 | 0.08 | 0.00 |
| Pent:Soft Silicates (Rec) | 0.03 | 0.01 | 0.02 | 0.00 | 0.03 |
| Pent:Hard Silicates (Rec) | 0.39 | 0.29 | 0.28 | 0.23 | 0.24 |
| Pentlandite:Chalcopyrite (Rec) | 0.01 | 0.43 | 0.06 | 0.02 | 0.04 |
| Pent:Fe Sul >20% Exp (Rec) | 8.10 | 8.77 | 6.82 | 5.22 | 6.21 |
| Lib Pentlandite | 8.07 | 12.2 | 8.59 | 8.19 | 8.78 |
| Free Pentlandite | 26.0 | 18.1 | 21.2 | 17.6 | 21.2 |
| Pure Pentlandite | 52.3 | 53.3 | 59.0 | 66.0 | 58.3 |

**Normalized Mass of Pentlandite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Pentlandite** | 52.3 | 53.3 | 59.0 | 66.0 | 58.3 |
| **Free Pentlandite** | 26.0 | 18.1 | 21.2 | 17.6 | 21.2 |
| **Lib Pentlandite** | 8.07 | 12.2 | 8.59 | 8.19 | 8.78 |
| **Pent:Fe Sul >20% Exp (Rec)** | 8.10 | 8.77 | 6.82 | 5.22 | 6.21 |
| **Pentlandite:Chalcopyrite (Rec)** | 0.01 | 0.43 | 0.06 | 0.02 | 0.04 |
| **Pent:Hard Silicates (Rec)** | 0.39 | 0.29 | 0.28 | 0.23 | 0.24 |
| **Pent:Soft Silicates (Rec)** | 0.03 | 0.01 | 0.02 | 0.00 | 0.03 |
| **Pent:Carbonates (Rec)** | 0.08 | 0.07 | 0.02 | 0.08 | 0.00 |
| **Pent:Oxides (Rec)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Recoverable - Complex Grains** | 1.67 | 3.90 | 0.97 | 0.72 | 2.52 |
| **Pent:Fe Sul <20% Exp/Lkd (Non Rec)** | 2.19 | 2.17 | 2.18 | 1.31 | 1.82 |
| **Non Recoverable - Exposed** | 0.90 | 0.70 | 0.68 | 0.54 | 0.78 |
| **Non Recoverable - Locked** | 0.25 | 0.14 | 0.15 | 0.11 | 0.08 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Potentially Recoverable Pentlandite** | **96.7** | **97.0** | **97.0** | **98.0** | **97.3** |

North American Nickel
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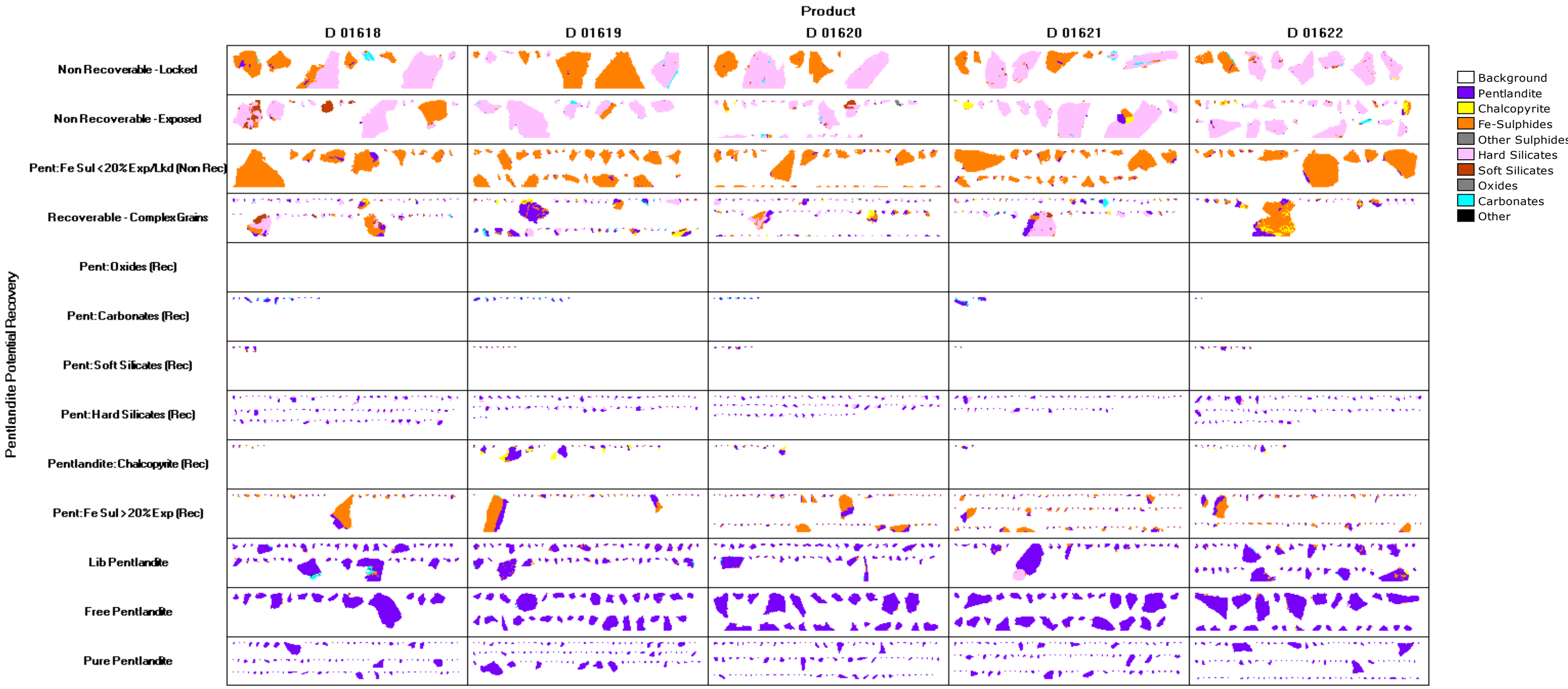
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Pentlandite Potential Recovery Image Grid**



North American Nickel
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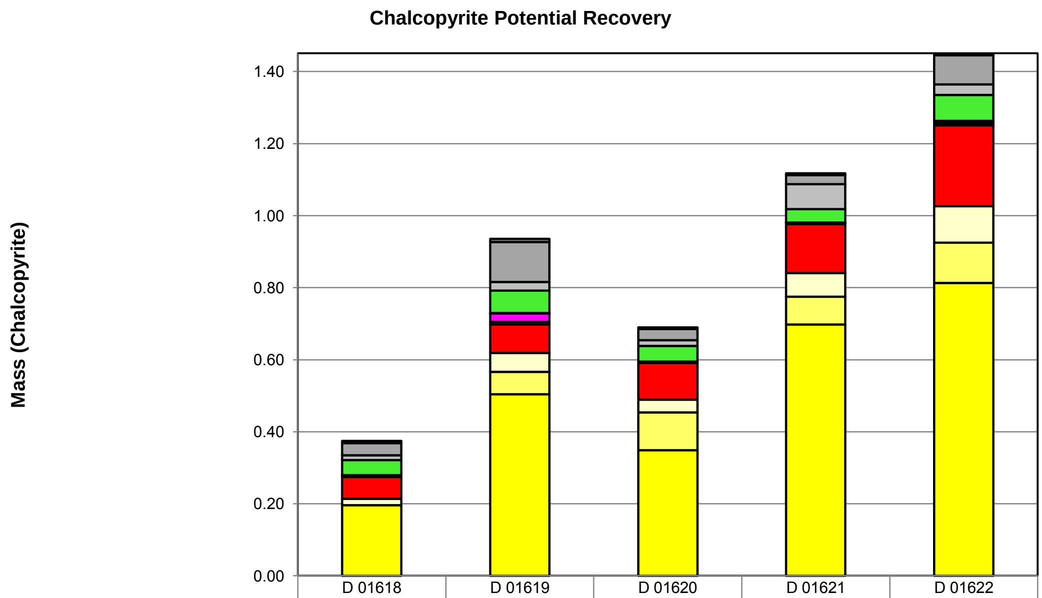
*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

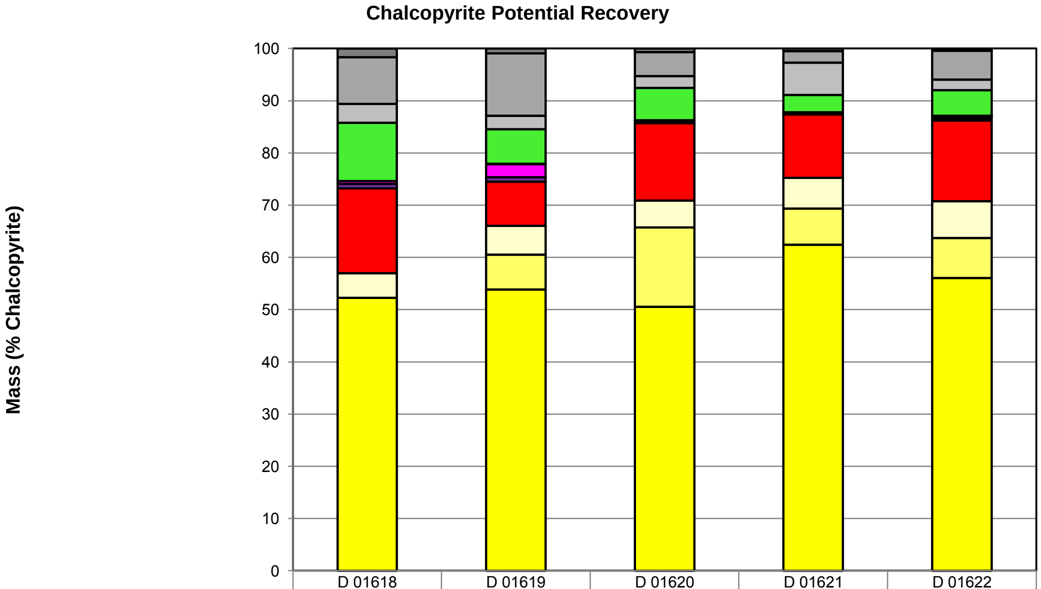
**Chalcopyrite Potential Recovery**




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Non Recoverable - Locked | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Non Recoverable - Exposed | 0.03 | 0.11 | 0.03 | 0.02 | 0.08 |
| Cpy:Fe Sul <20% Exp/Lkd (Non Rec) | 0.01 | 0.02 | 0.02 | 0.07 | 0.03 |
| Recoverable - Complex Grains | 0.04 | 0.06 | 0.04 | 0.04 | 0.07 |
| Cpy:Oxides (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Carbonates (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Soft Silicates (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Hard Silicates (Rec) | 0.00 | 0.02 | 0.00 | 0.00 | 0.01 |
| Cpy:Pent (Rec) | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Cpy:Fe Sul >20% Exp (Rec) | 0.06 | 0.08 | 0.10 | 0.14 | 0.22 |
| Lib Cpy | 0.02 | 0.05 | 0.04 | 0.07 | 0.10 |
| Free Cpy | 0.00 | 0.06 | 0.10 | 0.08 | 0.11 |
| Pure Cpy | 0.20 | 0.50 | 0.35 | 0.70 | 0.81 |

**Absolute Mass of Chalcopyrite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Cpy** | 0.20 | 0.50 | 0.35 | 0.70 | 0.81 |
| **Free Cpy** | 0.00 | 0.06 | 0.10 | 0.08 | 0.11 |
| **Lib Cpy** | 0.02 | 0.05 | 0.04 | 0.07 | 0.10 |
| **Cpy:Fe Sul >20% Exp (Rec)** | 0.06 | 0.08 | 0.10 | 0.14 | 0.22 |
| **Cpy:Pent (Rec)** | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| **Cpy:Hard Silicates (Rec)** | 0.00 | 0.02 | 0.00 | 0.00 | 0.01 |
| **Cpy:Soft Silicates (Rec)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Cpy:Carbonates (Rec)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Cpy:Oxides (Rec)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Recoverable - Complex Grains** | 0.04 | 0.06 | 0.04 | 0.04 | 0.07 |
| **Cpy:Fe Sul <20% Exp/Lkd (Non Rec)** | 0.01 | 0.02 | 0.02 | 0.07 | 0.03 |
| **Non Recoverable - Exposed** | 0.03 | 0.11 | 0.03 | 0.02 | 0.08 |
| **Non Recoverable - Locked** | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| **Total** | 0.37 | 0.94 | 0.69 | 1.12 | 1.45 |




| | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| Non Recoverable - Locked | 1.65 | 0.95 | 0.68 | 0.48 | 0.41 |
| Non Recoverable - Exposed | 8.95 | 11.9 | 4.60 | 2.21 | 5.56 |
| Cpy:Fe Sul <20% Exp/Lkd (Non Rec) | 3.64 | 2.56 | 2.27 | 6.18 | 1.99 |
| Recoverable - Complex Grains | 11.1 | 6.64 | 6.22 | 3.30 | 4.95 |
| Cpy:Oxides (Rec) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cpy:Carbonates (Rec) | 0.00 | 0.03 | 0.00 | 0.00 | 0.02 |
| Cpy:Soft Silicates (Rec) | 0.00 | 0.02 | 0.01 | 0.03 | 0.07 |
| Cpy:Hard Silicates (Rec) | 0.54 | 2.54 | 0.43 | 0.18 | 0.35 |
| Cpy:Pent (Rec) | 0.91 | 0.84 | 0.08 | 0.24 | 0.45 |
| Cpy:Fe Sul >20% Exp (Rec) | 16.2 | 8.43 | 14.8 | 12.2 | 15.5 |
| Lib Cpy | 4.69 | 5.56 | 5.17 | 5.87 | 7.02 |
| Free Cpy | 0.00 | 6.68 | 15.2 | 6.89 | 7.67 |
| Pure Cpy | 52.3 | 53.8 | 50.6 | 62.5 | 56.1 |

**Normalized Mass of Chalcopyrite Across Samples**

| Mineral Name | D 01618 | D 01619 | D 01620 | D 01621 | D 01622 |
|---|---|---|---|---|---|
| **Pure Cpy** | 52.3 | 53.8 | 50.6 | 62.5 | 56.1 |
| **Free Cpy** | 0.00 | 6.68 | 15.2 | 6.89 | 7.67 |
| **Lib Cpy** | 4.69 | 5.56 | 5.17 | 5.87 | 7.02 |
| **Cpy:Fe Sul >20% Exp (Rec)** | 16.2 | 8.43 | 14.8 | 12.2 | 15.5 |
| **Cpy:Pent (Rec)** | 0.91 | 0.84 | 0.08 | 0.24 | 0.45 |
| **Cpy:Hard Silicates (Rec)** | 0.54 | 2.54 | 0.43 | 0.18 | 0.35 |
| **Cpy:Soft Silicates (Rec)** | 0.00 | 0.02 | 0.01 | 0.03 | 0.07 |
| **Cpy:Carbonates (Rec)** | 0.00 | 0.03 | 0.00 | 0.00 | 0.02 |
| **Cpy:Oxides (Rec)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Recoverable - Complex Grains** | 11.1 | 6.64 | 6.22 | 3.30 | 4.95 |
| **Cpy:Fe Sul <20% Exp/Lkd (Non Rec)** | 3.64 | 2.56 | 2.27 | 6.18 | 1.99 |
| **Non Recoverable - Exposed** | 8.95 | 11.9 | 4.60 | 2.21 | 5.56 |
| **Non Recoverable - Locked** | 1.65 | 0.95 | 0.68 | 0.48 | 0.41 |
| **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Potentially Recoverable Chalcopyrite** | **85.8** | **84.6** | **92.5** | **91.1** | **92.0** |

North American Nickel
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*High Definition Mineralogical Analysis using QEMSCAN (Quantitative Evaluation of Materials by Scanning Electron Microscopy)*

**Chalcopyrite Potential Recovery Image Grid**