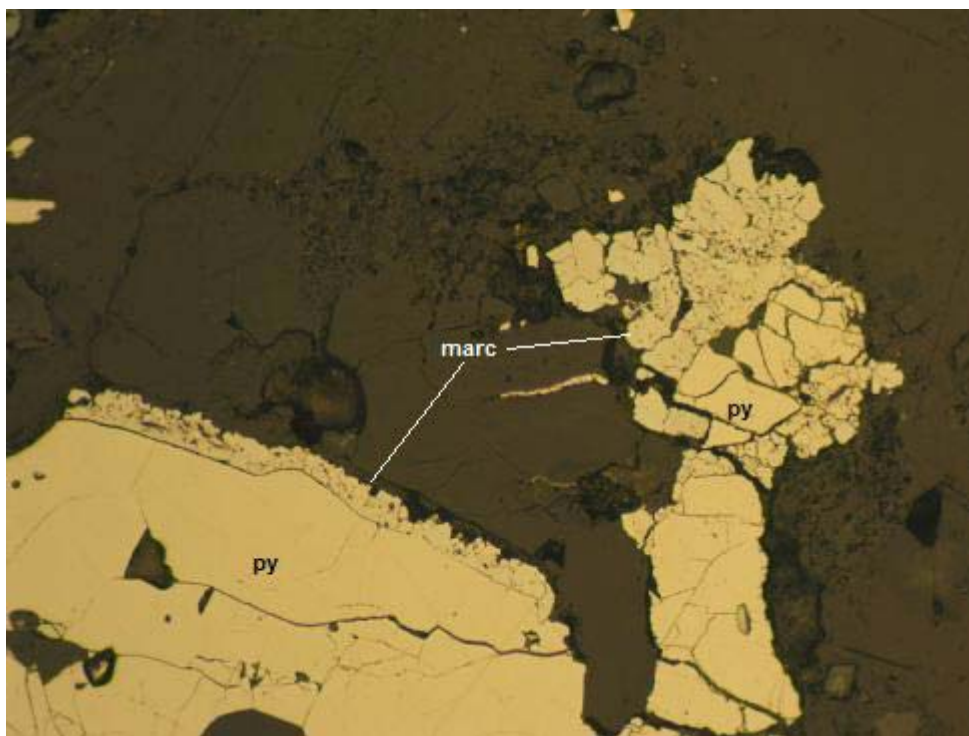


I



J

**K08-17-174-177:** I) Anhedral grains of chalcopyrite, sphalerite and pyrite. RL. FOV  $\approx$  0.7 mm. J) Anhedral pyrite rimmed by marcasite aggregate within granitoid chip. RL. FOV  $\approx$  0.7 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: K08-19-150-153

Offcut #: BD-9

**Chip and Offcut Mount Description:**

Fine to coarse angular chips (less than 12 mm size) and very fine grains. Chips include aphanitic light grey to olive brown biotite hornfels, white fine-grained leucocratic granitoid (graphic texture evident in stained offcut) and quartz veins. Minor disseminated pyrite. No reaction of chips to cold, dilute HCl. No reaction of chips to magnet. Reaction of some fragments to etching with HF and staining with sodium cobaltinitrite (yellow stain ~30% alkali feldspar).

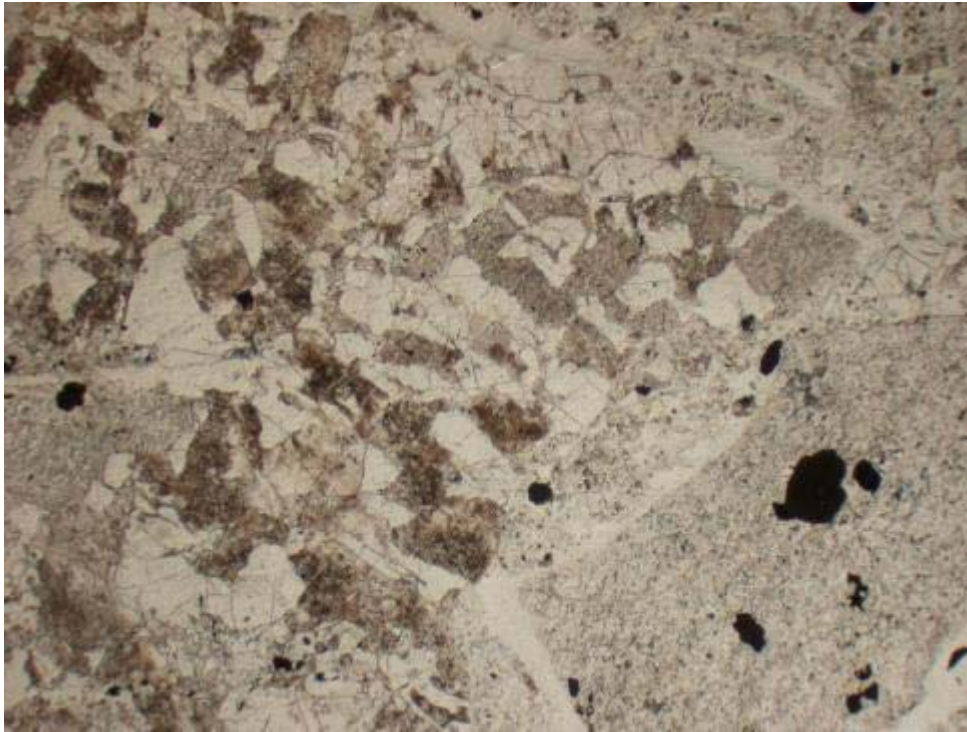
**Polished Thin Section Description:**

Fine to coarse chips representing very fine-grained biotite hornfels, pervasively sericite±carbonate altered hornfels, granite/alkali feldspar granite (alaskite/aplite), quartz±molybdenite±pyrite veinlets, K-feldspar±carbonate veinlets as well as numerous liberated grains of quartz, K-feldspar and pyrite. The biotite hornfels has a granoblastic to locally foliated texture and comprises very fine-grained quartz, cloudy feldspar, subhedral brown biotite and locally minor disseminated pyrite. In some hornfels chips, the biotite and some feldspar are replaced by sericite± carbonate aggregate. Hornfels fragments are locally cut by fine-grained K-feldspar±carbonate veinlets (< 0.4 mm wide). Biotite occurs in minor amounts (~3%) in the section. Sericite occurs in minor amounts (~2%) as replacement of biotite and locally plagioclase in alkali feldspar granite fragments. Very fine-grained cloudy plagioclase in the hornfels occurs in major amounts (~20%). Biotite is partly replaced by traces of chlorite in some hornfels fragments. The granite/alkali feldspar granite is fine to medium-grained (< 2 mm), equigranular and comprises perthitic K-feldspar, quartz (graphic texture common) and locally minor plagioclase and traces of sericite. Quartz veinlet fragments are fine to medium-grained and anhedral. Quartz comprises approximately 40% of the section.

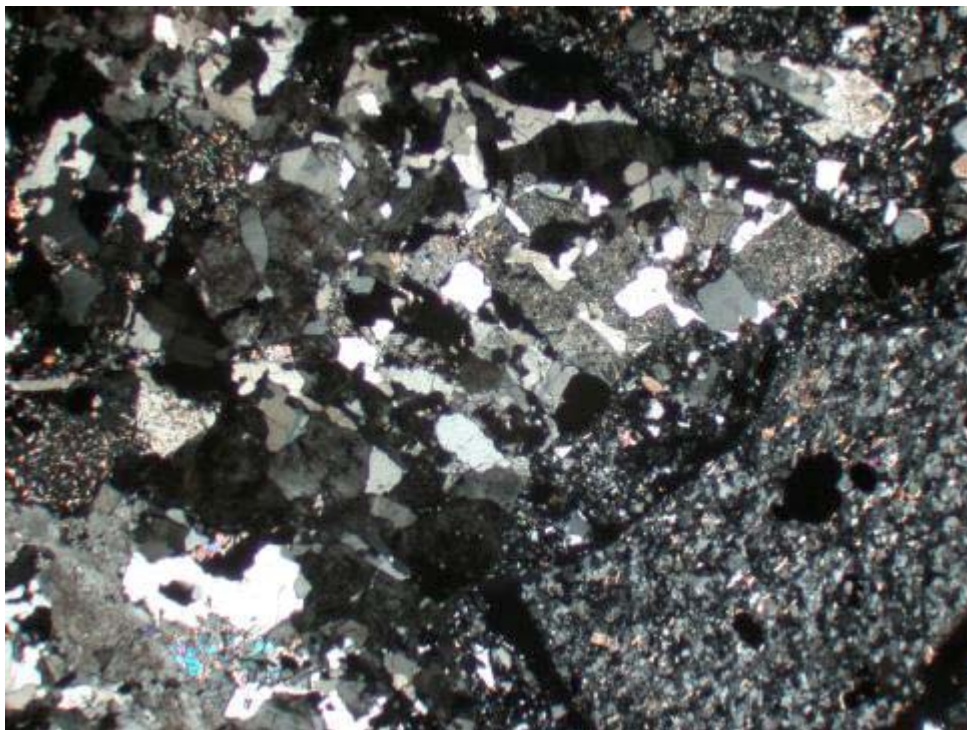
Carbonate occurs in minor amounts (~1%) as colourless and brown carbonate. Colourless carbonate occurs as fine to very fine-grained anhedral patchy aggregates within sericite-carbonate altered hornfels, as fine-grained aggregates (< 0.2 mm) within K-feldspar veinlets and as fine-grained veinlets. Brown carbonate occurs as very fine-grained patchy anhedral aggregates replacing perthite, as patchy aggregates in hornfels and locally as liberated aggregates. In a few fragments, brown carbonate aggregates are partly replaced by very fine-grained red-brown Fe-ox.

Sulphide occurs in minor amounts, ~ 3%, as pyrite with traces of molybdenite, pyrrhotite and rare chalcopyrite, marcasite and sphalerite. Pyrite, ~ 3%, occurs as liberated eu-anhedral grains (typically < 0.3 mm, rarely 0.7 mm), disseminated within sericite±carbonate and biotite hornfels, granite and within quartz vein chips. Pyrite grain boundaries vary from straight to irregular. Pyrite rims are typically unaltered. Rarely pyrite grains within biotite hornfels are partly replaced by red-brown Fe-ox. Traces of anhedral pyrrhotite occur disseminated as fine grains (< 0.1 mm) within a couple of biotite hornfels chips. Disseminated pyrrhotite within biotite hornfels typically has irregular grain boundaries but alteration rims are absent. Traces of very fine-grained chalcopyrite occur associated with pyrrhotite, enclosed by pyrite and as liberated grains. Traces of very fine-grained marcasite occur associated with pyrite in one sericite-altered hornfels fragment and as liberated aggregates. Traces of fine-grained molybdenite occur within quartz vein fragments and as liberated plates. Rare traces of sphalerite occur associated with molybdenite and sericite in a quartz vein fragment.

Red-brown Fe-ox occurs in trace amounts in the section. Fe-ox occurs as replacement of brown carbonate, rarely as replacement of pyrite and as liberated aggregates.

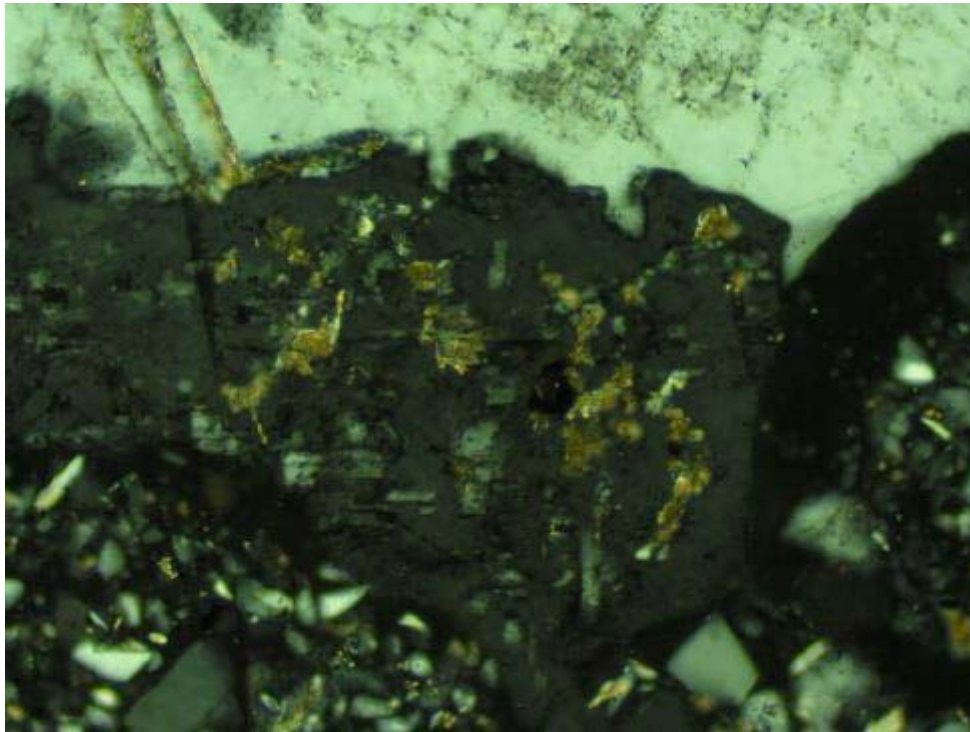


A

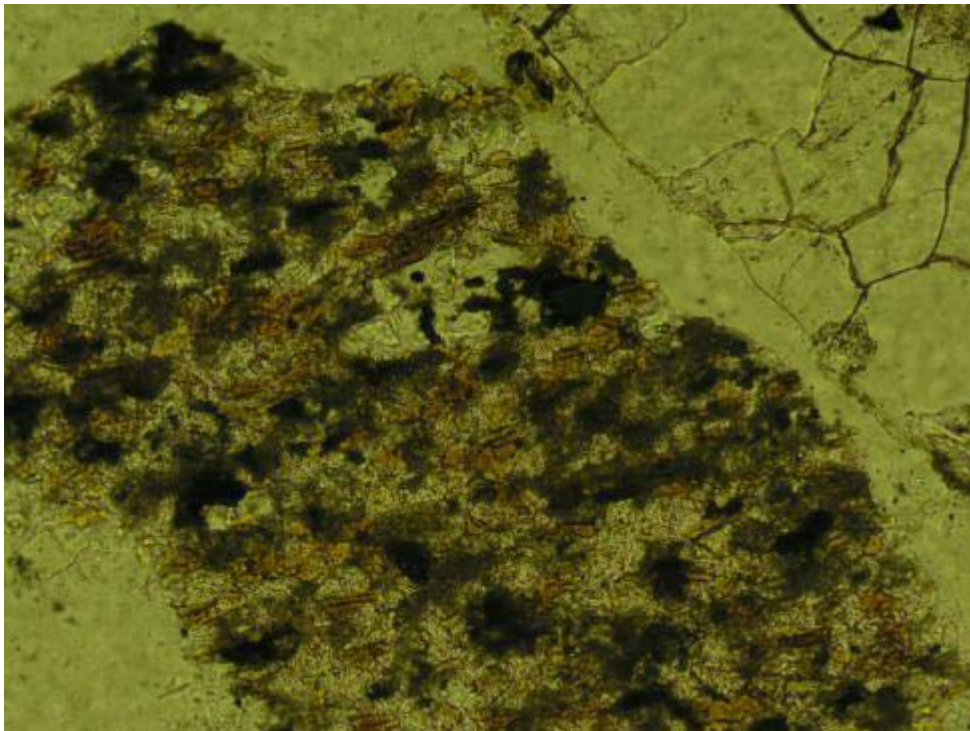


B

**K08-19-150-153:** A&B) Representative view of alaskite (left) and biotite hornfels (lower right). A) PPL, B) XPL, FOV  $\approx$  4.5 mm.

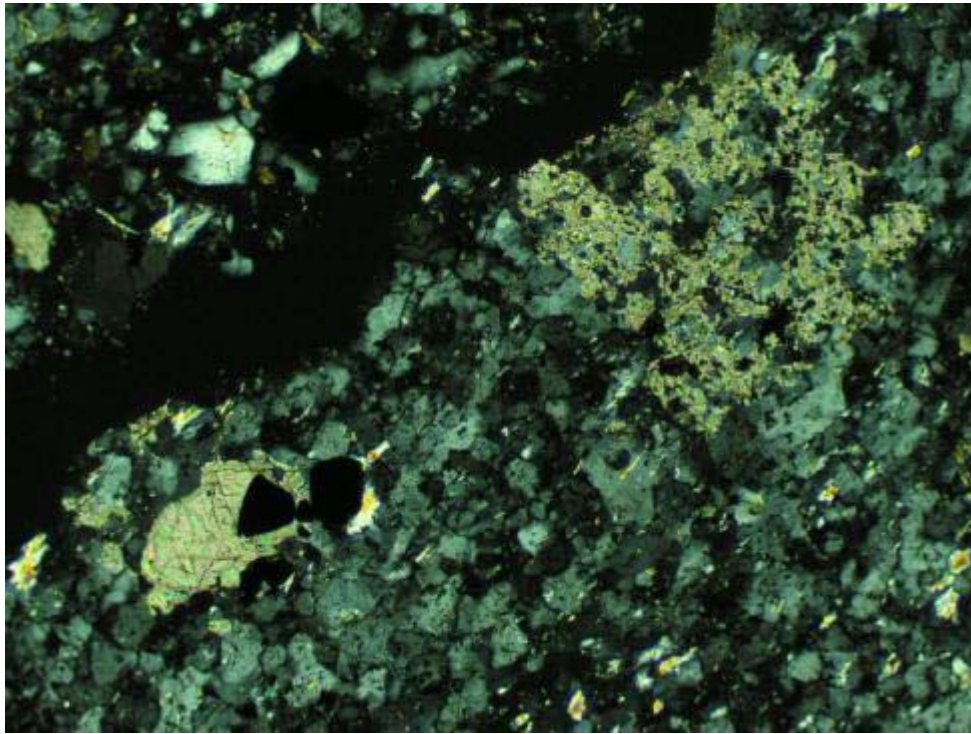


C

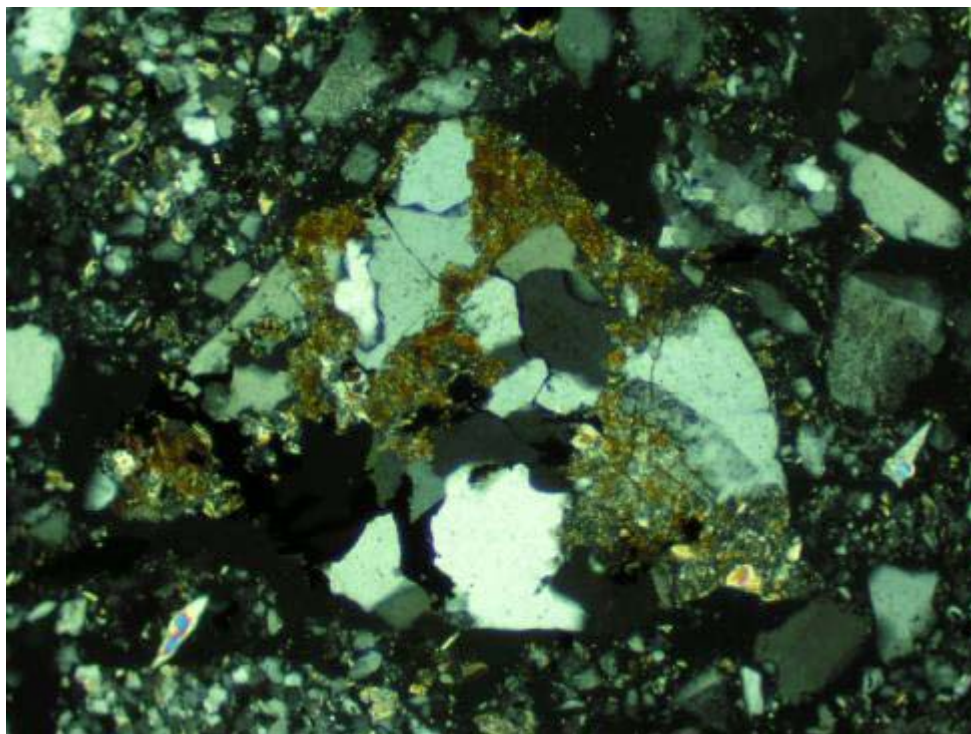


D

**K08-19-150-153:** C) Patchy brown carbonate aggregate as replacement of perthite in alaskite fragment. XPL, FOV  $\approx$  0.7 mm, D) Patchy very fine-grained brown carbonate as replacement of biotite hornfels. PPL, FOV  $\approx$  0.7 mm

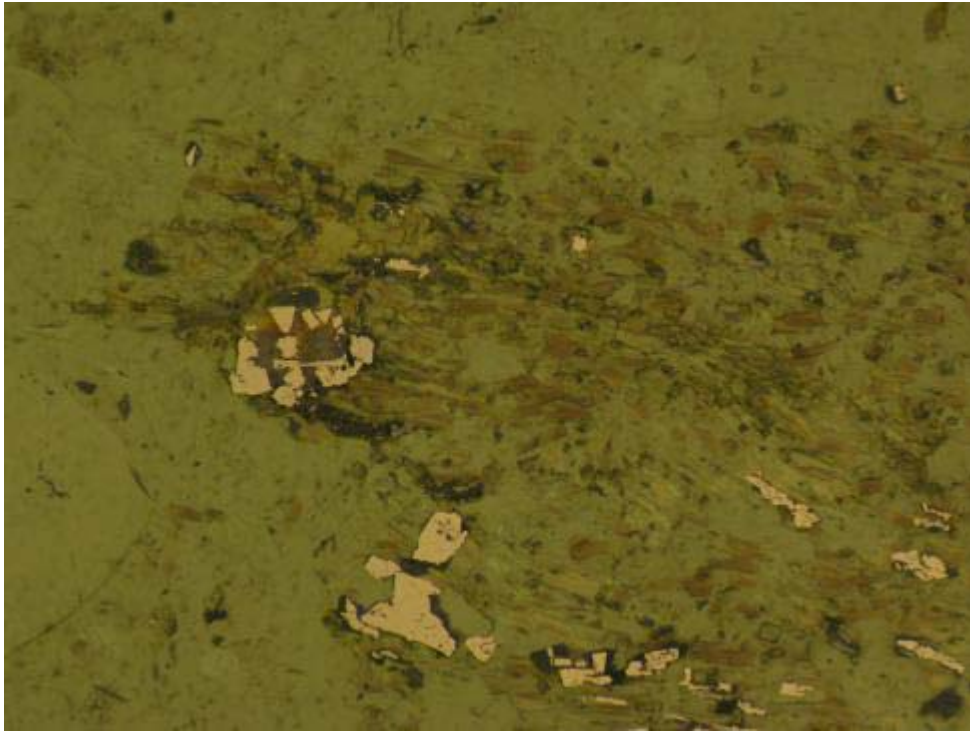


E

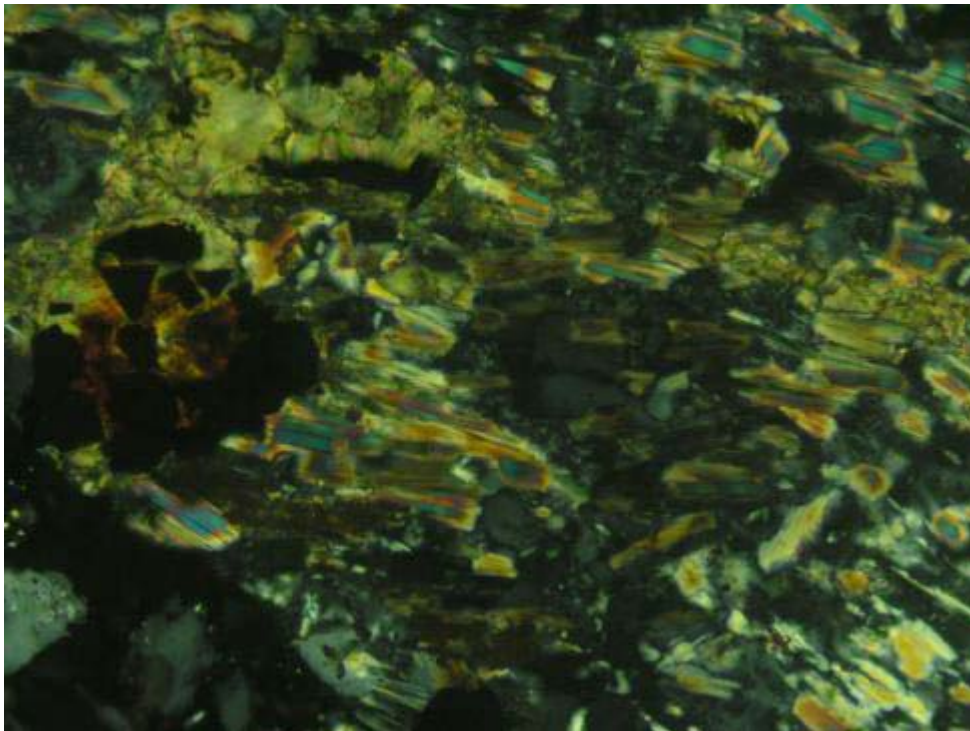


F

**K08-19-150-153:** E) Patchy colourless carbonate partly replacing sericite-altered hornfels. XPL. FOV  $\approx$  1.3 mm. F) Alaskite fragment with patchy Fe-ox aggregate replacing carbonate. XPL. FOV  $\approx$  1.3 mm.

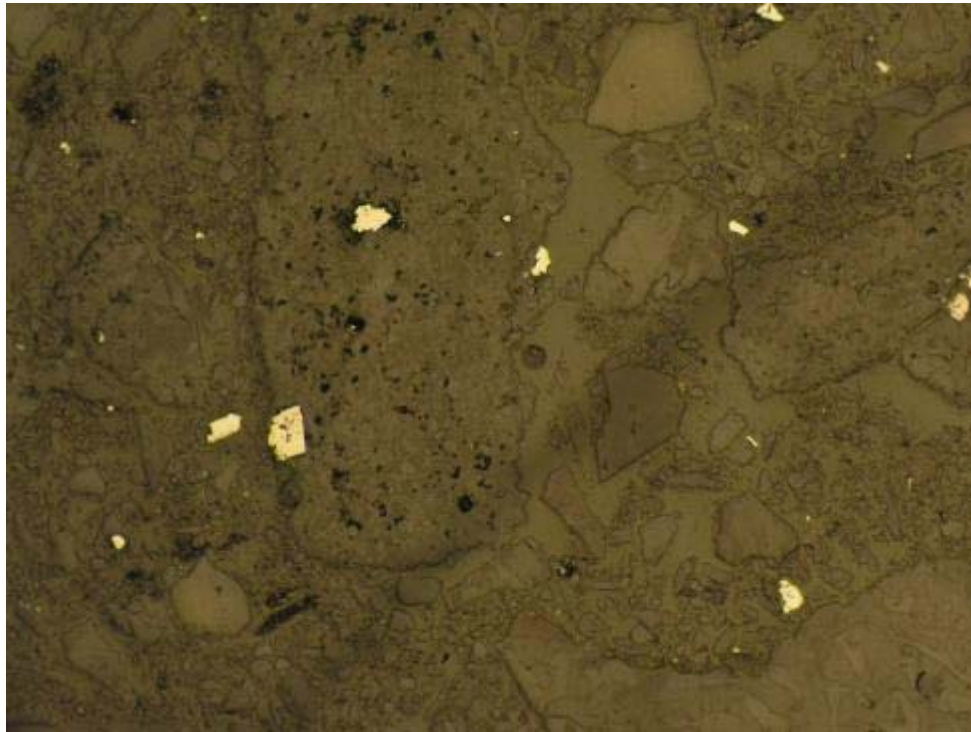


G

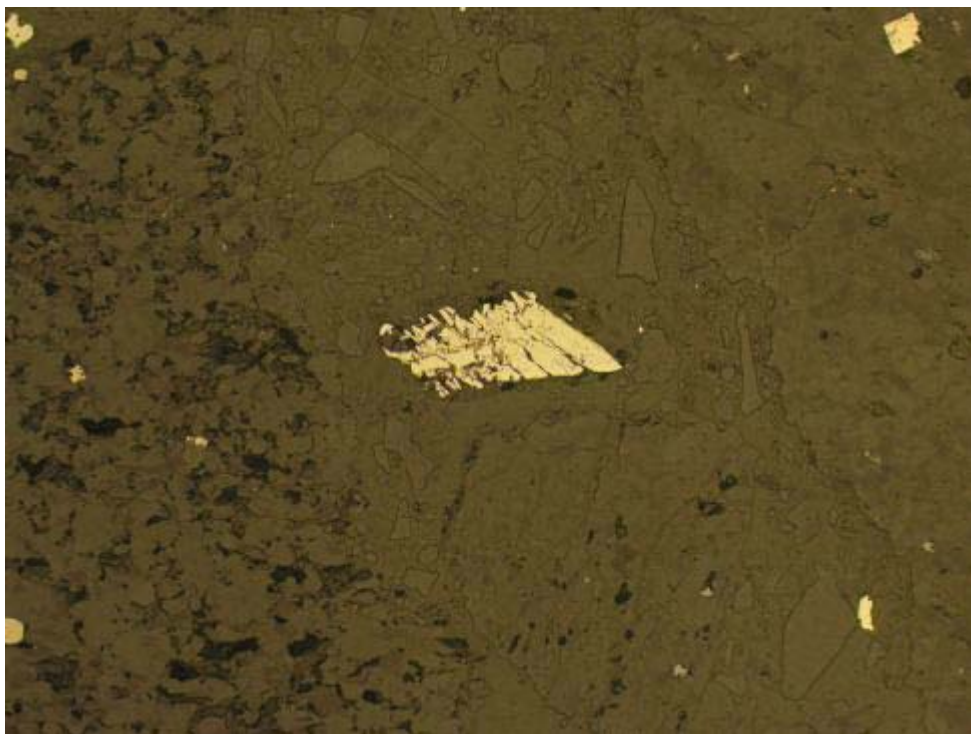


H

**K08-19-150-153:** G) Disseminated pyrite within biotite hornfels. RL+PPL. FOV ≈ 0.7 mm. H) Detailed view of left side of photo G. Note Fe-ox stained carbonate adjacent to altered pyrite aggregate (left). XPL. FOV ≈ 0.3 mm.



I



J

**K08-19-150-153:** I) Distribution of liberated pyrite and pyrite disseminated within fragments in the section. RL. FOV  $\approx$  2.6 mm. J) Liberated marcasite aggregate. RL. FOV  $\approx$  1.3 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: K08-22-141-144

Offcut #: BD-8

**Chip and Offcut Mount Description:**

Fine to coarse angular chips (less than 11 mm size) and finely crushed grains. Chips include fine to medium-grained biotite granitoid and quartz veins with traces of pyrite and molybdenite. No reaction of some granitoid chips to cold, dilute HCl but trace reaction of finely crushed grains in sample to HCl. No reaction to magnet. Reaction of some fragments to etching with HF and staining with sodium cobaltinitrite (yellow stain ~40% alkali feldspar).

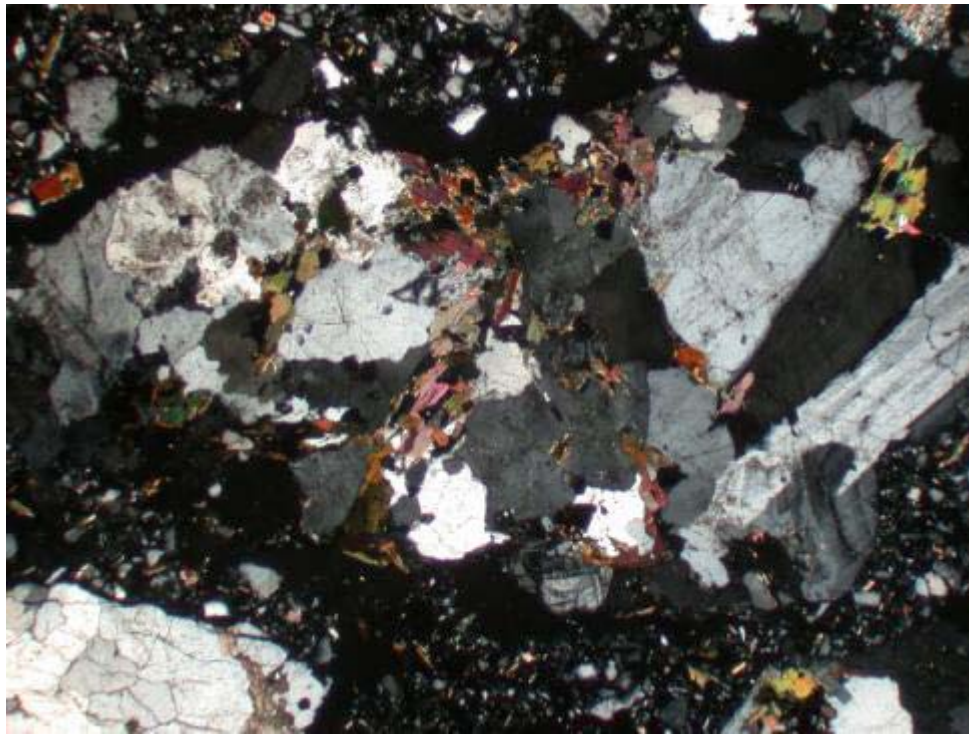
**Polished Thin Section Description:**

Fine to coarse chips representing fine to medium-grained biotite granitoid, quartz veins, gypsum±anhydrite± carbonate veins and abundant liberated grains including mostly quartz, K-feldspar, plagioclase, gypsum aggregate, biotite and anhydrite. The granitoid composition varies from fragment to fragment but typically includes fine to medium-grained quartz, altered plagioclase, K-feldspar (perthitic) and biotite with traces of titanite and apatite; green amphibole occurs rarely. Plagioclase (approximately 10% of the section) is commonly replaced by fine to very fine-grained sericite and locally overprinted by patchy carbonate. Sericite comprises approximately 3% of the section. Biotite within the granitoid occurs in as fine to medium-grained (< 2 mm) green plates and aggregates. Biotite comprises approximately 6% of the section. Traces of chlorite occurs locally replacing biotite. Quartz within veinlets is anhedral and fine-grained; carbonate and gypsum occur as infill. Fine-grained gypsum±anhydrite± carbonate occur as liberated vein fragments. Gypsum also occurs as fracture infill and patchy replacement of granitoid fragments. Gypsum comprises approximately 7% of the section. Anhydrite occurs in trace amounts. Quartz comprises approximately 30% of the section.

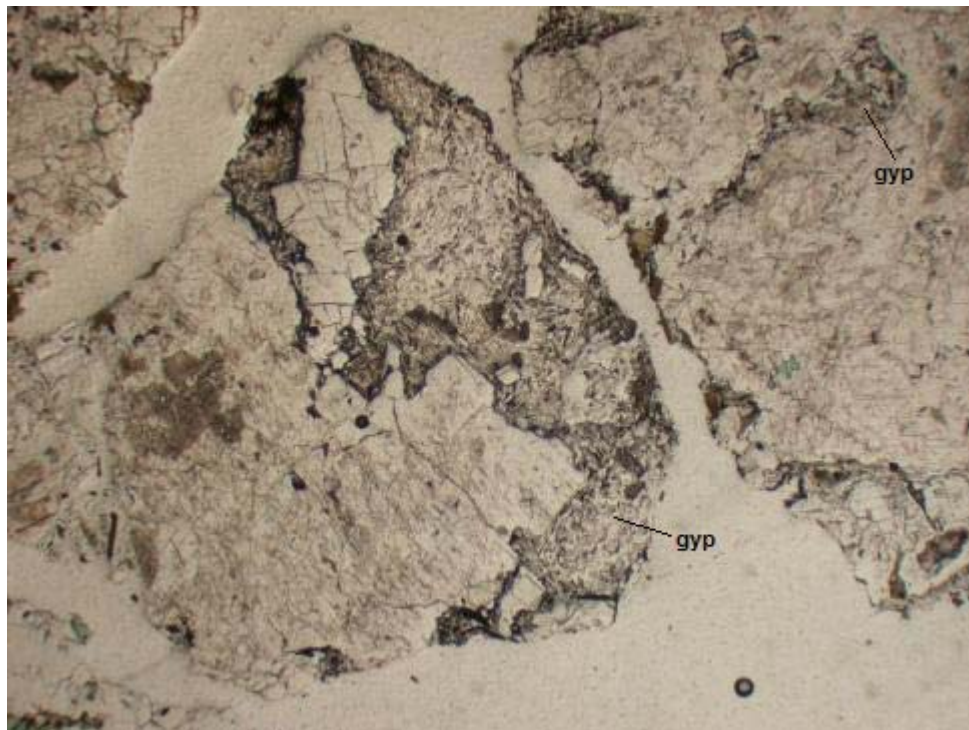
Carbonate occurs in minor amounts (~1%) as colourless carbonate. Colourless carbonate occurs as fine-grained (< 0.2 mm) subhedral to rhombic liberated grains, as fine-grained (< 0.5 mm) eu-subhedral aggregates in chips with gypsum and anhydrite, as very fine-grained aggregates forming irregular patches overprinting sericite replacement of plagioclase and as fracture infill/veinlets.

Sulphide occurs in minor amounts, approximately 2%, as pyrite with traces of molybdenite and rarely chalcopyrite. Pyrite, approximately 2%, occurs as liberated eu-anhedral grains (< 0.2 mm) and disseminated as eu-subhedral grains and aggregates in granitoid chips. Pyrite grains are unaltered. Some pyrite grains are associated with aggregates of Ti-ox. Molybdenite occurs as fine-grained (< 0.15 mm) platy to flaky grains within granitoid fragments. Chalcopyrite occurs rarely as inclusions in pyrite. Rare fine grains of chalcopyrite (< 0.07 mm) occur in granitoid chips.

Traces of magnetite occur as fine grains and aggregates in a few granitoid chips and as liberated grains.

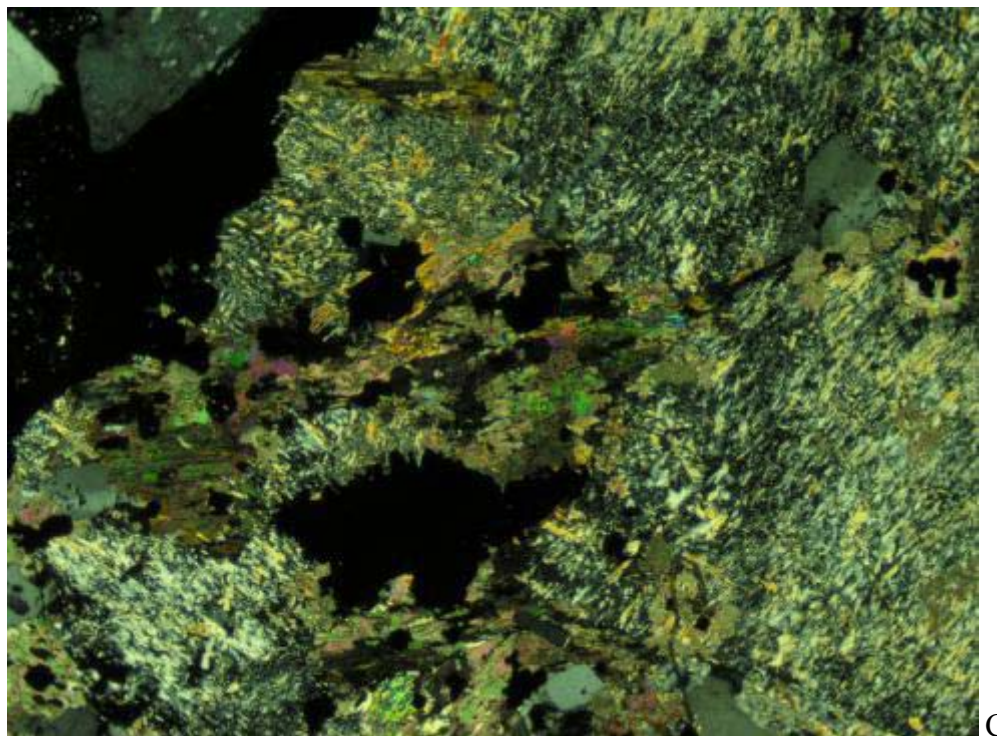


A

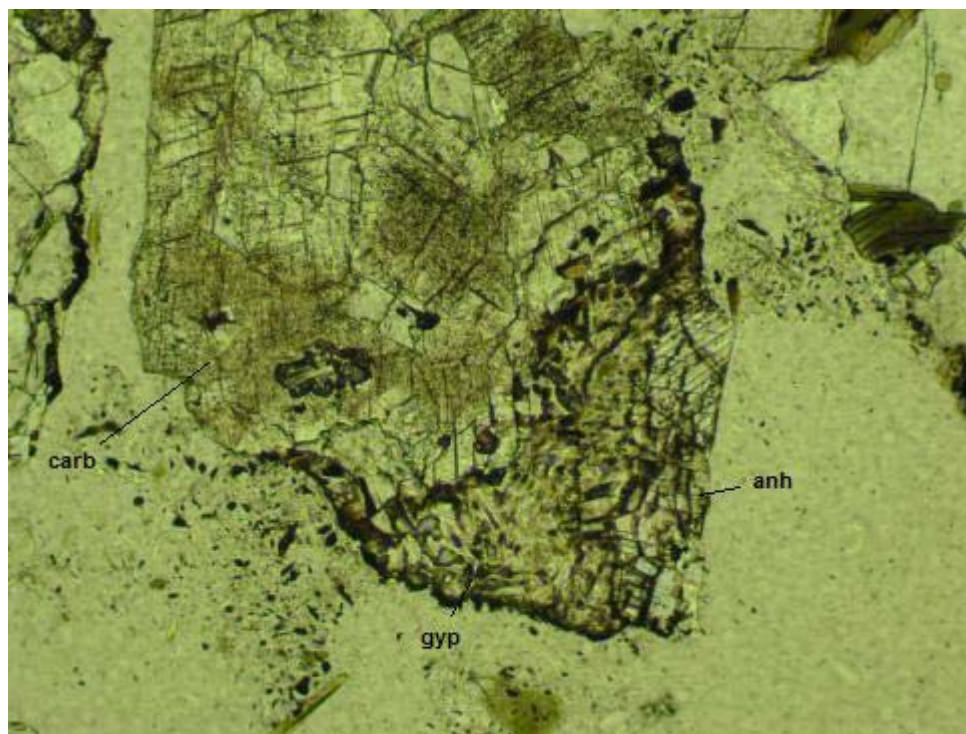


B

**K08-22-141-144:** A) Representative view of biotite granitoid. XPL, FOV ≈ 4.5 mm. B) Granitoid chips with veinlets and fracture infill by gypsum (gyp). PPL, FOV ≈ 4.5 mm.

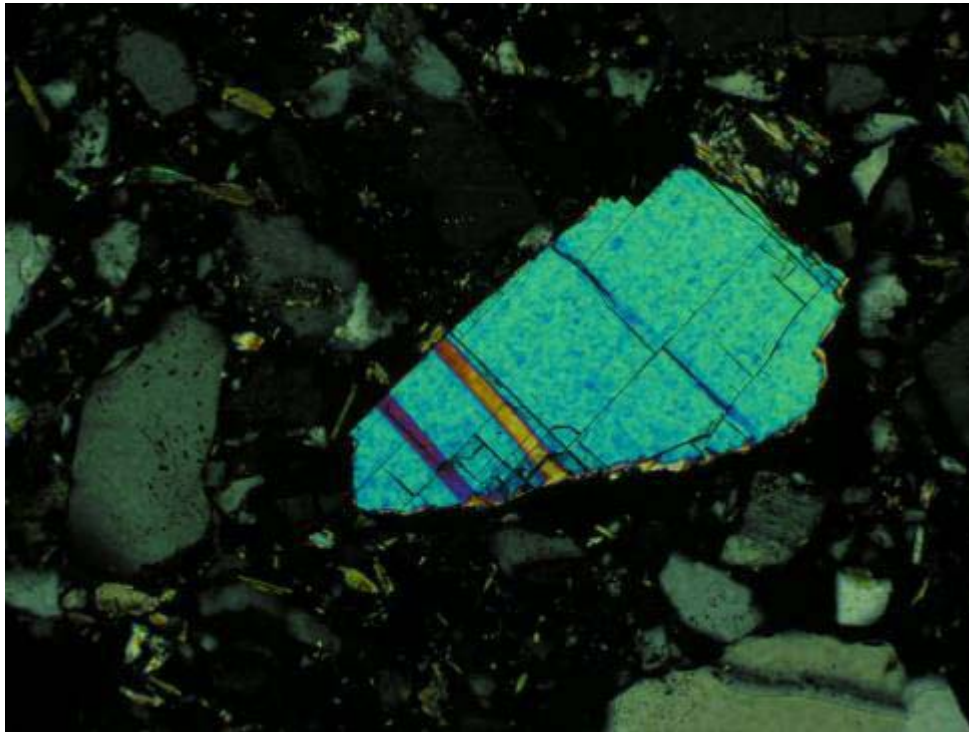


C

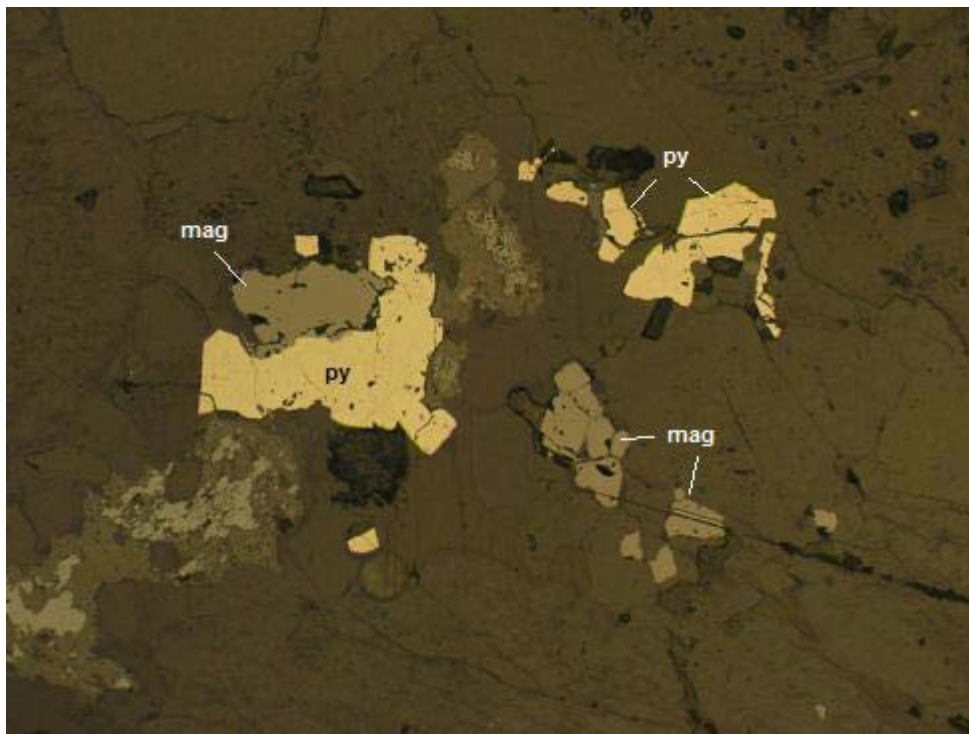


D

**K08-22-141-144:** C) View of former plagioclase replaced by sericite aggregate and overprinted by patchy carbonate. XPL, FOV ≈ 2.6 mm. D) Fragment of carbonate-gypsum-anhydrite vein. PPL, FOV ≈ 1.3 mm.

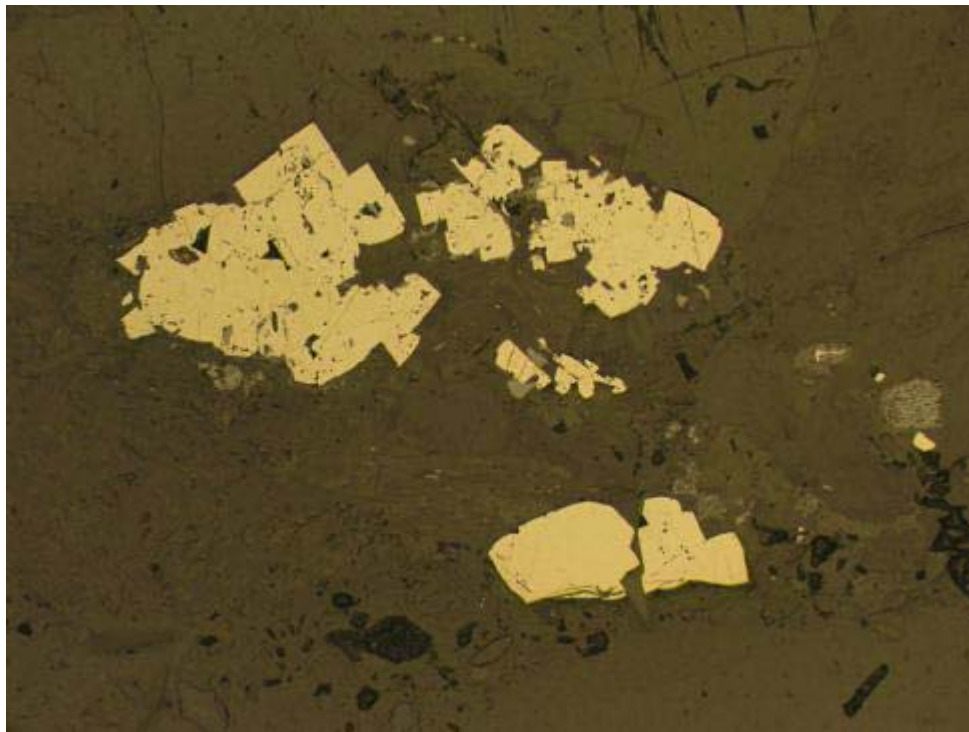


E

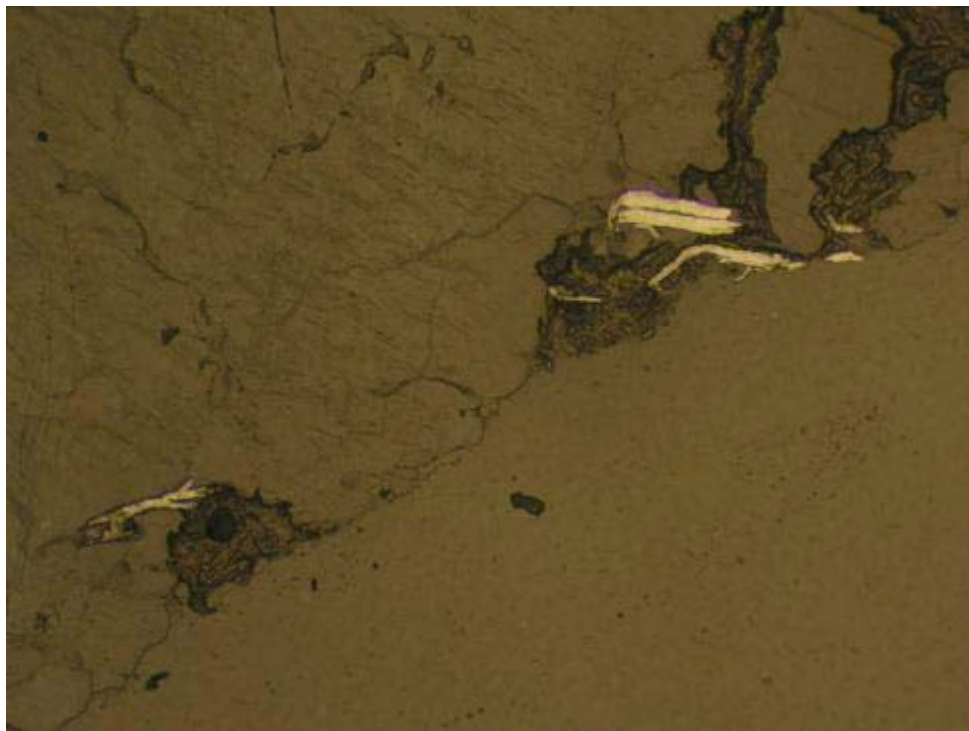


F

**K08-22-141-144:** E) Liberated grain of anhydrite. XPL. FOV  $\approx$  1.3 mm. F) Pyrite and magnetite within granitoid. RL. FOV = 1.3 mm.



G



H

**K08-22-141-144:** G) Euhedral pyrite aggregate within granitoid chip. RL. FOV  $\approx$  1.3 mm. H) Platy molybdenite in within granitoid chip. RL. FOV  $\approx$  1.3 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: K08-22-144-147

Offcut #: BD-7

**Chip and Offcut Mount Description:**

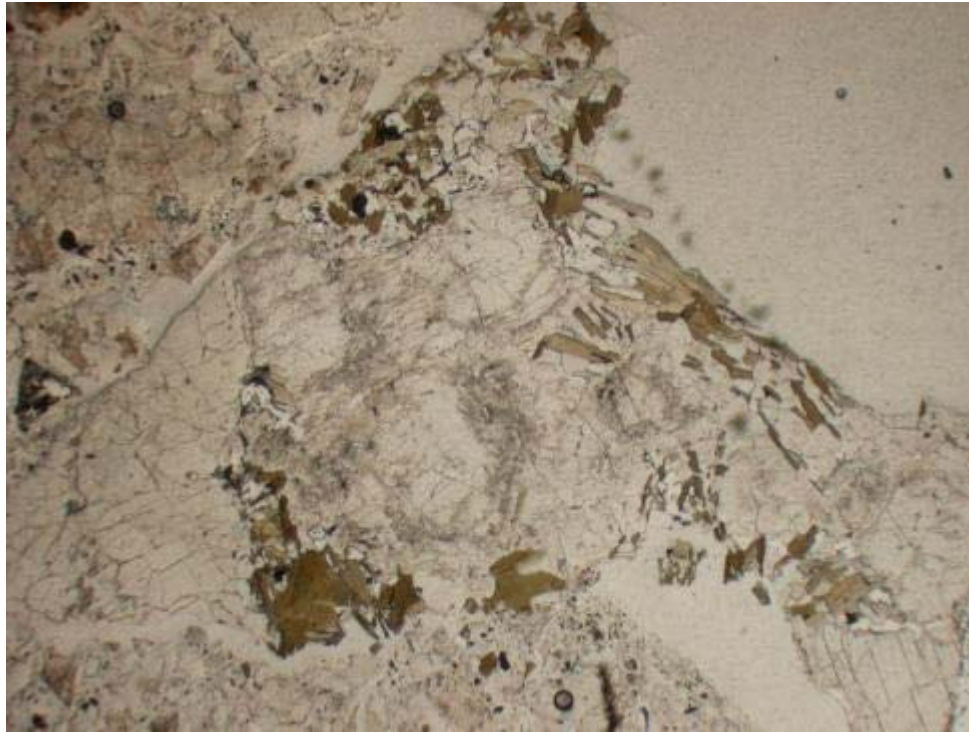
Fine to coarse angular chips (less than 11 mm size) and finely crushed grains. Chips include fine to medium-grained biotite granitoid and quartz veins with traces of pyrite and molybdenite. No reaction to cold, dilute HCl. No reaction to magnet. Reaction of some fragments to etching with HF and staining with sodium cobaltinitrite (yellow stain ~30% alkali feldspar).

**Polished Thin Section Description:**

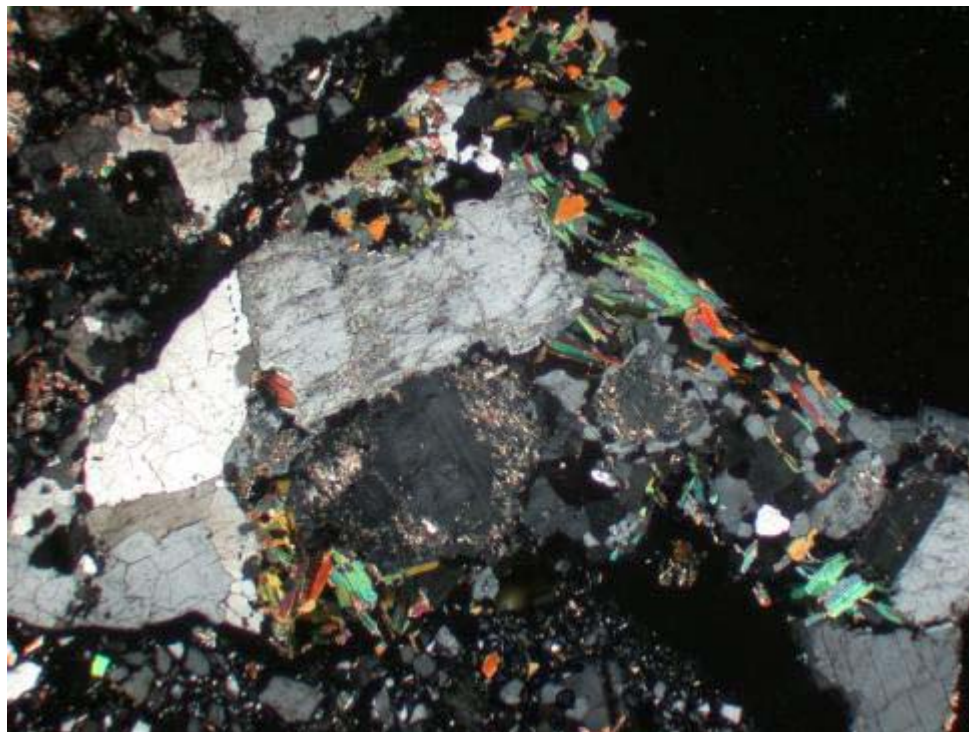
Fine to coarse chips representing fine to medium-grained biotite granitoid, quartz veins and abundant liberated grains including mostly quartz, K-feldspar, plagioclase, gypsum aggregate and biotite. The granitoid composition varies from fragment to fragment but typically includes fine to medium-grained quartz, altered plagioclase, K-feldspar (perthitic) and biotite with traces of titanite and apatite. Plagioclase (approximately 7% of the section) is commonly replaced by fine to very fine-grained sericite and locally overprinted by patchy carbonate. Sericite comprises approximately 3% of the section. Biotite within the granitoid occurs in as fine to medium-grained (< 2 mm) green plates and aggregates. Biotite comprises approximately 5% of the section. Traces of chlorite, Ti-oxide and carbonate occur rarely replacing biotite. Quartz within veinlets is anhedral and fine to medium-grained; carbonate and muscovite occur as infill. Fine-grained gypsum ± rare anhydrite occur as liberated vein fragments. Gypsum also occurs as fracture infill and patchy replacement of granitoid fragments. Gypsum comprises approximately 7% of the section. Quartz comprises approximately 45% of the section.

Carbonate occurs in minor amounts (approximately 1%) as colourless carbonate. Colourless carbonate occurs as fine-grained (< 0.15 mm) anhedral liberated grains, as fine to very fine-grained aggregates forming irregular patches overprinting sericite replacement of plagioclase and as fracture infill.

Sulphide occurs in minor amounts, approximately 1%, as pyrite with traces of molybdenite and rare sphalerite and galena. Pyrite, approximately 1%, occurs as liberated eu-anhedral grains (< 0.16 mm) and disseminated as eu-anhedral grains and aggregates in granitoid chips. Pyrite grains are unaltered. Some pyrite grains are associated with aggregates of Ti-ox. Molybdenite occurs as fine-grained (< 0.35 mm) platy liberated grains and disseminated within granitoid fragments. Rare fine grains of sphalerite (< 0.22 mm) and galena (0.82 mm) occur as liberated grains.

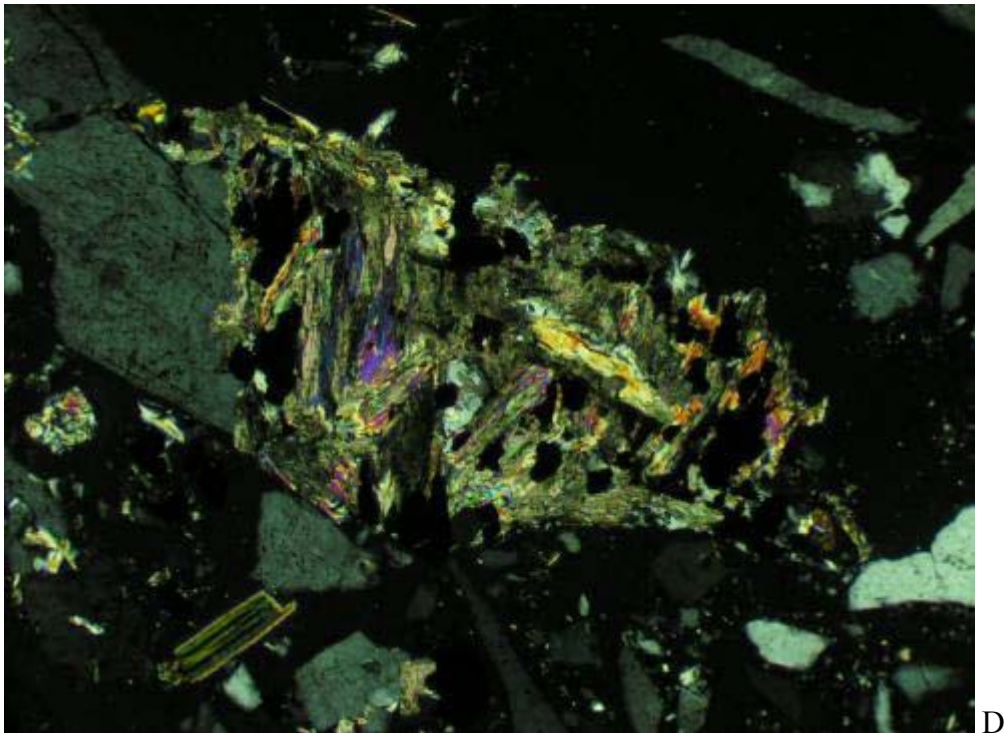
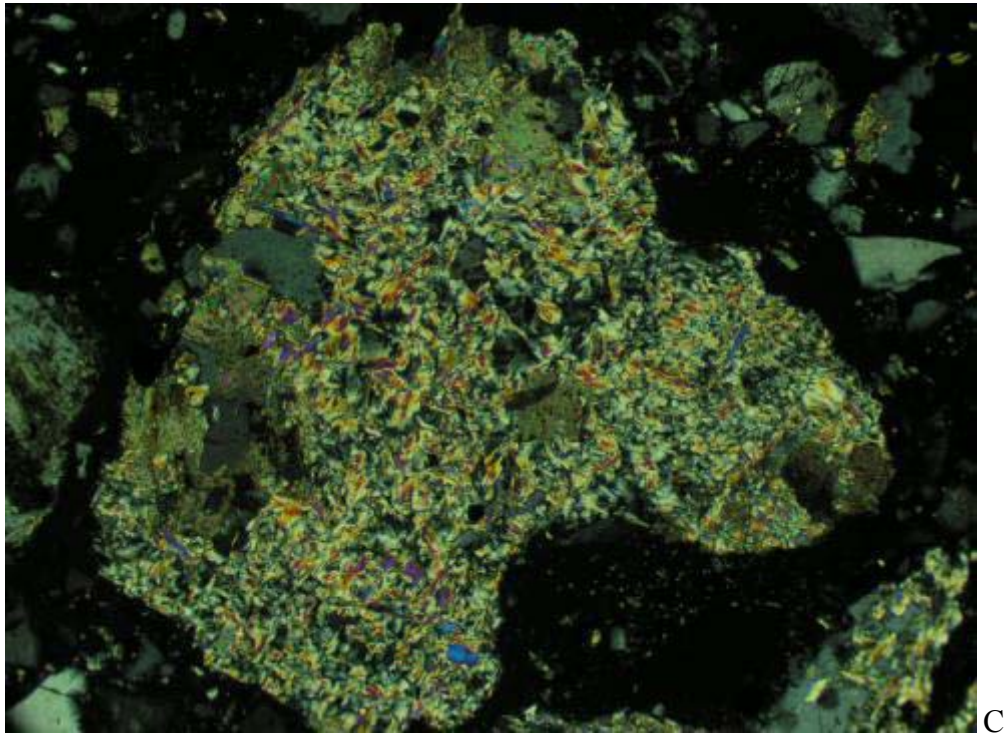


A

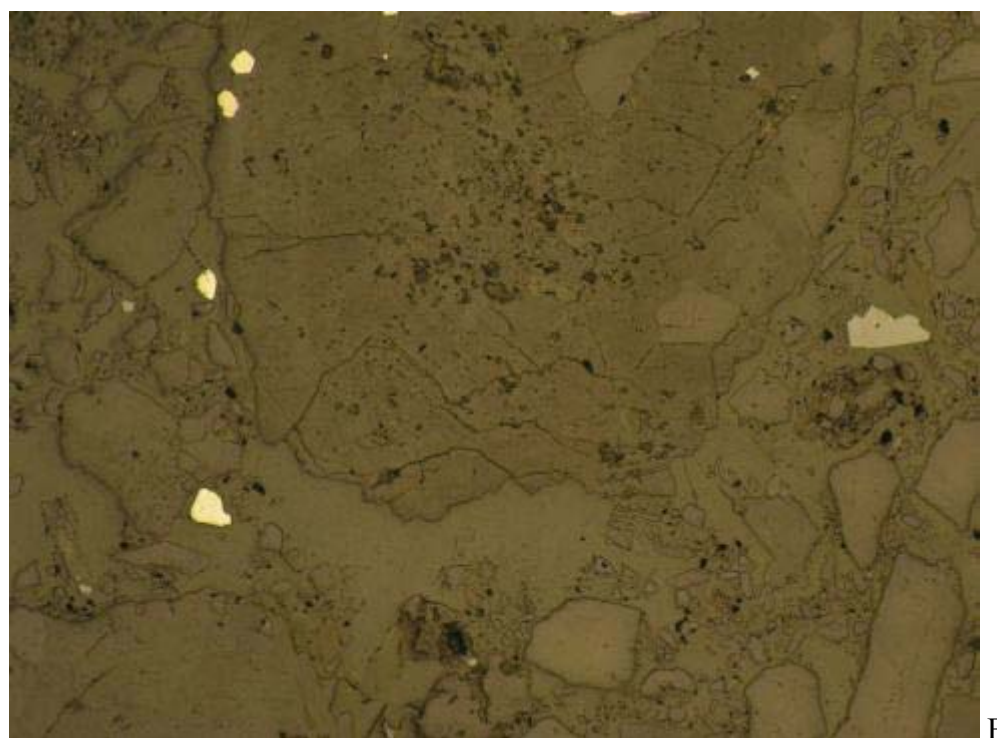
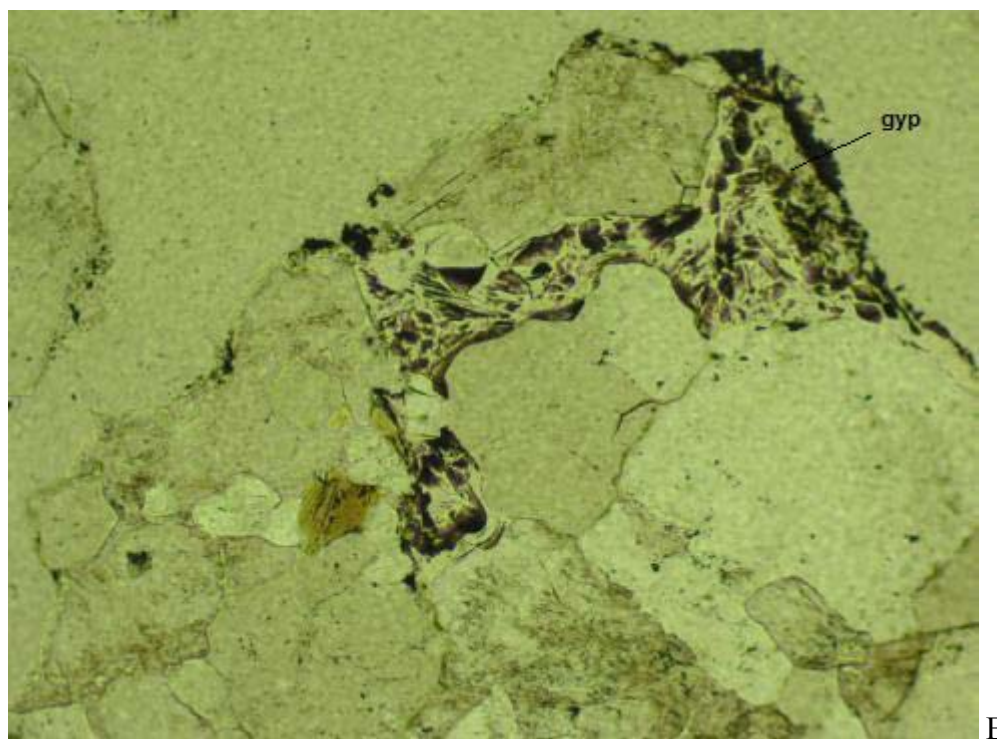


B

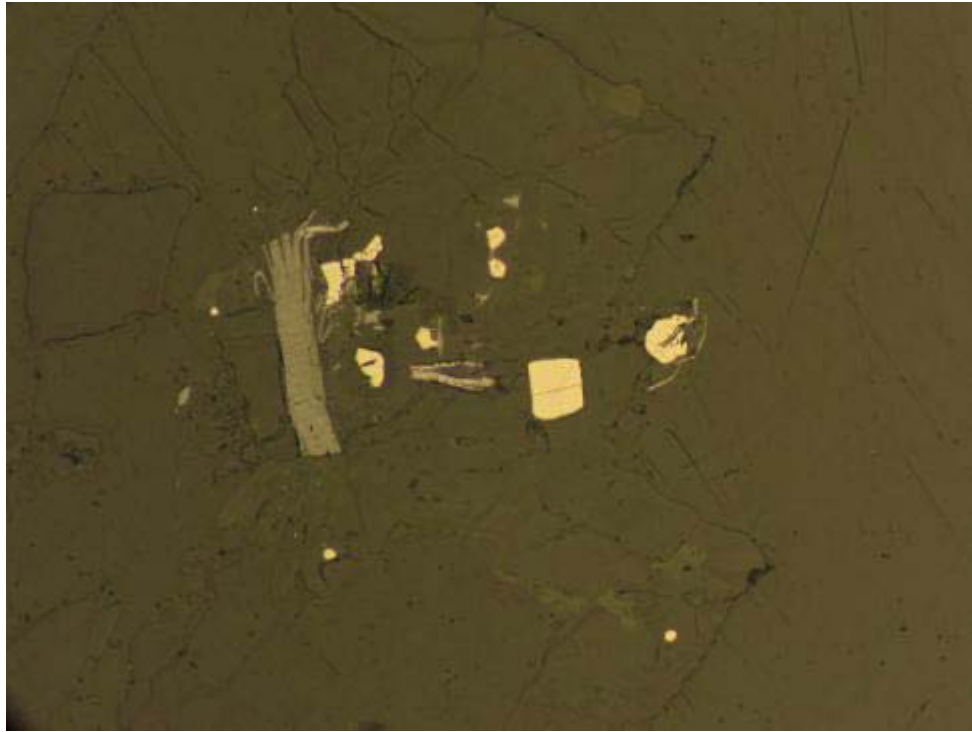
**K08-22-144-147:** A&B) Representative view of biotite granitoid. A) PPL, B) XPL, FOV ≈ 4.5 mm.



**K08-22-144-147:** C) View of former plagioclase replaced by sericite aggregate and overprinted by patchy carbonate. XPL, FOV  $\approx$  1.3 mm. D) Patchy carbonate-muscivite-pyrite (opaque) aggregate. XPL, FOV  $\approx$  1.3 mm.



**K08-22-144-147:** E) Gypsum aggregate as patchy replacement of granitoid fragment. PPL. FOV  $\approx$  1.3 mm. F) Distribution of liberated pyrite and pyrite disseminated in granitoid fragment. Note liberated sphalerite grain (right). RL. FOV = 2.6 mm.



G



H

**K08-22-144-147:** G) Euhedral pyrite and platy molybdenite within granitoid chip. RL. FOV  $\approx$  0.7 mm. H) Liberated galena aggregate. RL. FOV  $\approx$  1.3 mm.

**SGS-CEMI Project #:** 0935Avanti Mining

**Sample ID:** K08-24-12-15

Offcut #: BD-6

**Chip and Offcut Mount Description:**

Fine to coarse angular chips (less than 15 mm size) and finely crushed grains. Chips include fine to medium-grained leucocratic granitoid and quartz veins (<1 to 2 mm wide) with K-feldspar alteration envelopes (based on stained mount. No reaction of chips to cold, dilute HCl. No reaction of chips to magnet. Reaction of some fragments of granitoid and vein envelopes to etching with HF and staining with sodium cobaltinitrite (yellow stain ~30% alkali feldspar).

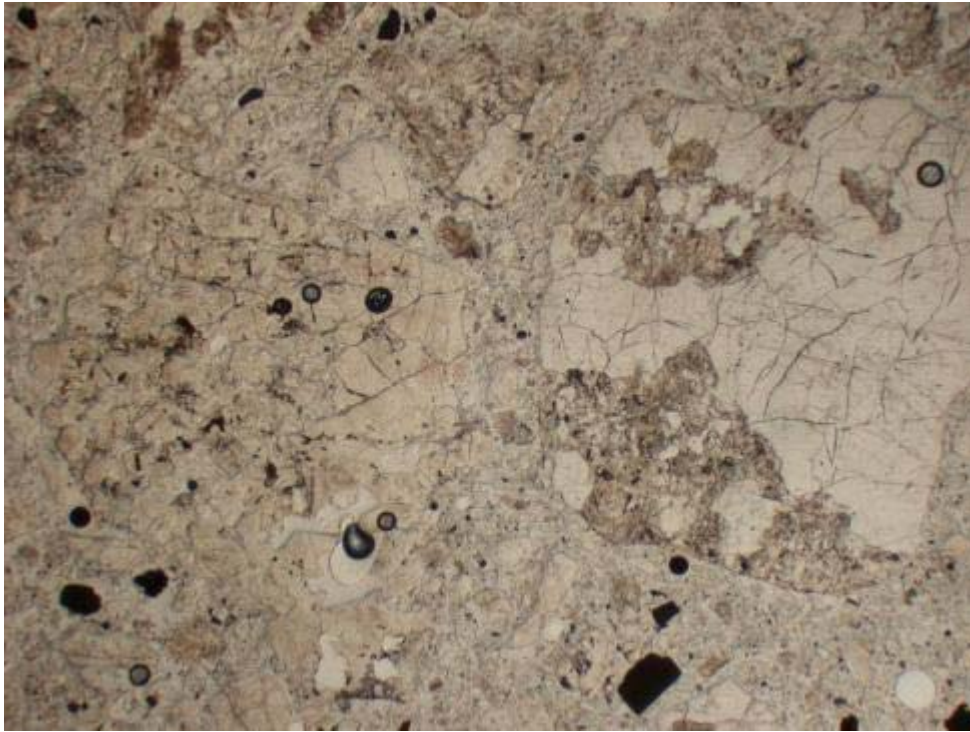
**Polished Thin Section Description:**

Fine to coarse chips representing fine to medium-grained leucocratic granitoid, quartz veinlets with K-feldspar envelopes and abundant liberated grains including mostly quartz, K-feldspar, sericite flakes/aggregate and pyrite. The leucocratic granitoid composition varies from fragment to fragment but typically includes fine to medium-grained K-feldspar, quartz, and sericite aggregate replacing former plagioclase and platy biotite. Locally the granitoid fragments are porphyritic with fine to medium-grained phenocrysts of K-feldspar and altered plagioclase in a finer-grained K-feldspar-quartz groundmass (< 0.2 mm). Plagioclase is virtually completely replaced by fine (< 0.1 mm) to very fine-grained sericite aggregate which comprises approximately 13% of the section. Traces of clay occurs with sericite as replacement of biotite in some granitoid fragments. Quartz within veinlets is anhedral and fine to medium-grained (< 3 mm). Quartz comprises approximately 50% of the section. Fine-grained apatite and rare zircon occur as accessory phases in the granitoid chips. Traces of Ti-oxide occurs as patchy aggregates in granitoid fragments and as replacement of former biotite.

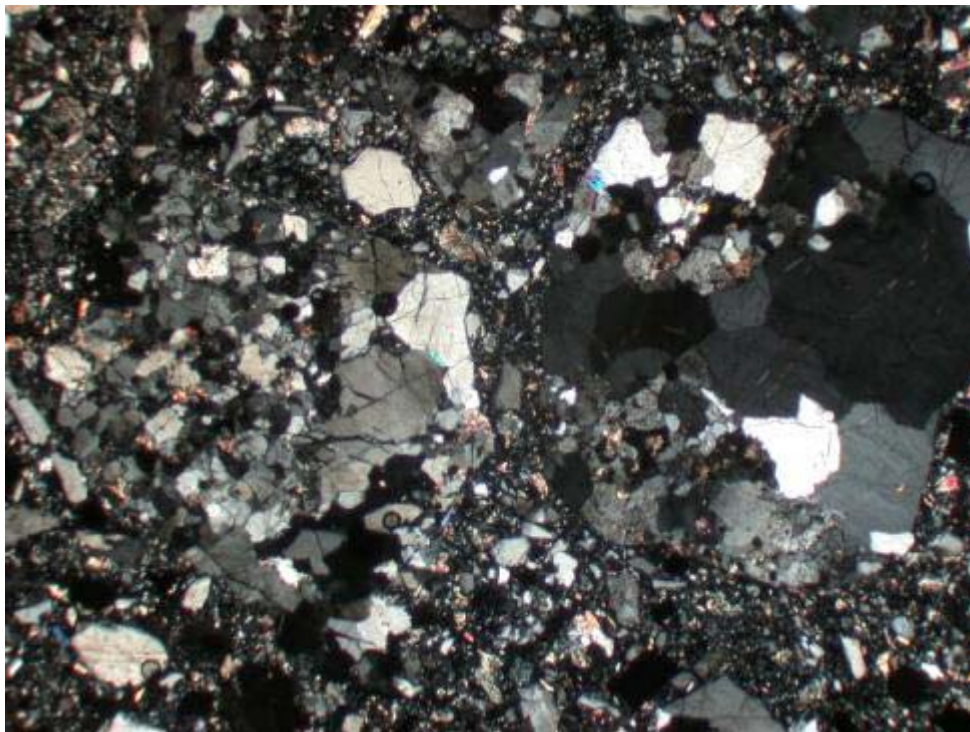
Carbonate occurs in minor amounts (~1%) as colourless and brown carbonate. Colourless carbonate occurs as fine-grained (< 0.2 mm) fracture infill, as irregular patchy aggregate within granitoid fragments and rarely as liberated grains. Brown carbonate is fine to very fine-grained (< 0.15 mm) and occurs as patchy aggregates associated with sericite replacement of biotite, as patchy aggregates in granitoid, as fracture infill and rarely as liberated grains. In one fragment, rare traces of red-brown Fe-ox occurs partly replacing brown carbonate aggregate.

Sulphide occurs in major amounts, approximately 5%, as pyrite with rare traces of galena, molybdenite, sphalerite and a rare unknown phase. Pyrite, approximately 5%, occurs dominantly as liberated anhedral grains (< 0.8 mm) and disseminated as eu-anhedral grains and aggregates in leucocratic granitoid chips. Pyrite grain boundaries vary from straight to irregular. Pyrite rims are unaltered. Rare inclusions of chalcopyrite occur in a couple of pyrite grains. Rare galena (0.1 mm) occurs enclosing pyrite in a granitoid chip and as infill to fractured liberated pyrite. Rare platy molybdenite (< 0.1 mm) occur disseminated in a granitoid fragment. Rare sphalerite (< 0.15 mm) occurs as liberated grains. The unknown phase occurs as very fine-grained anhedral aggregates with the optical properties of arsenopyrite. Fragments of the unknown phase have irregular grain boundaries with a rimmed appearance without secondary products.

Red-brown Fe-ox grains occur rarely as liberated grains, as patches within granitoid and as replacement of brown carbonate (one fragment only).

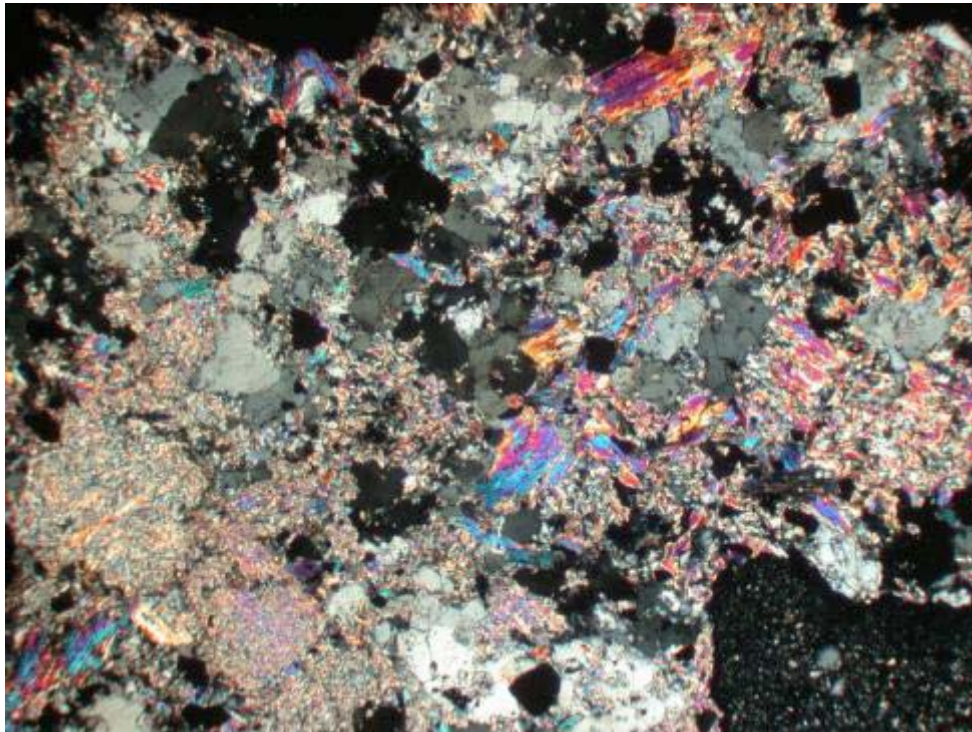


A

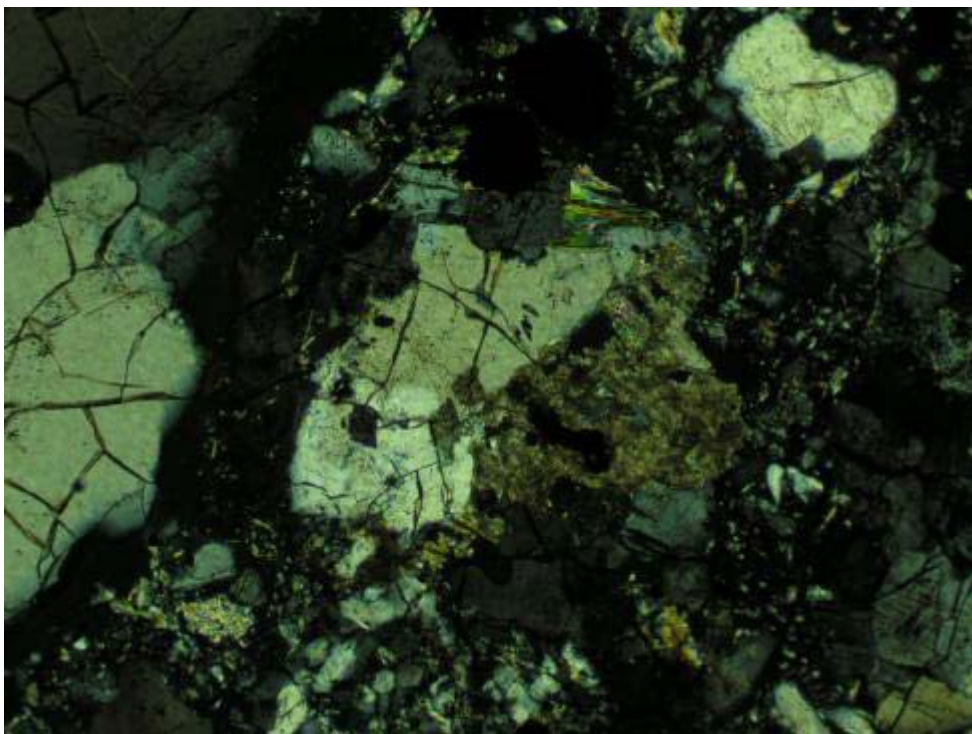


B

**K08-24-12-15:** A) Representative chips of quartz veins within granitoid fragments. A) PPL, B) XPL, FOV ≈ 4.5 mm.

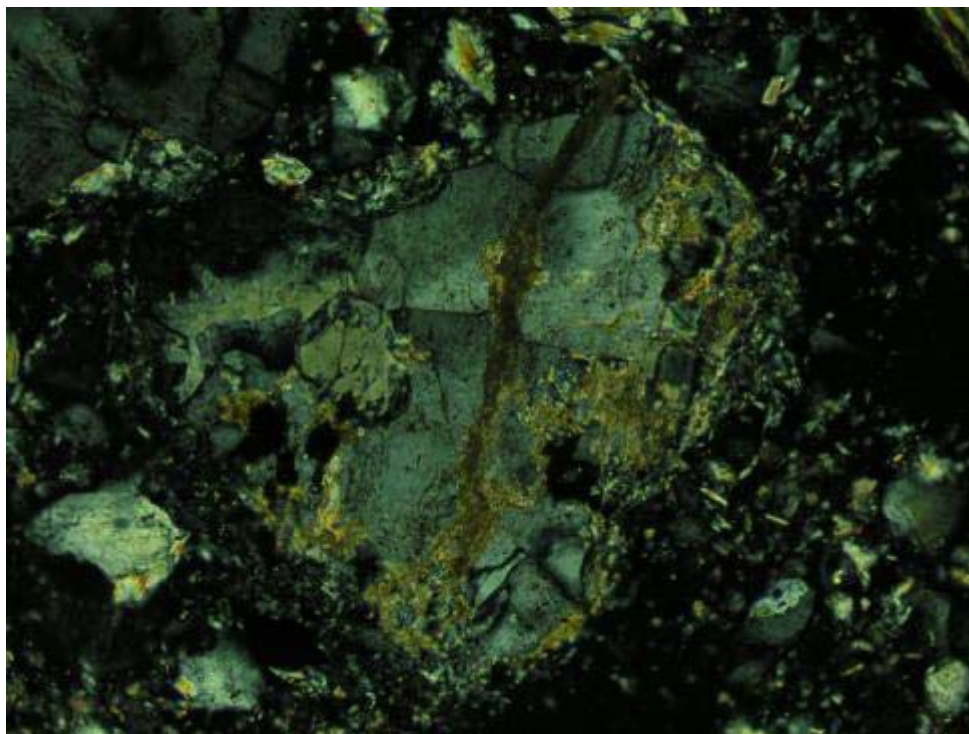


C

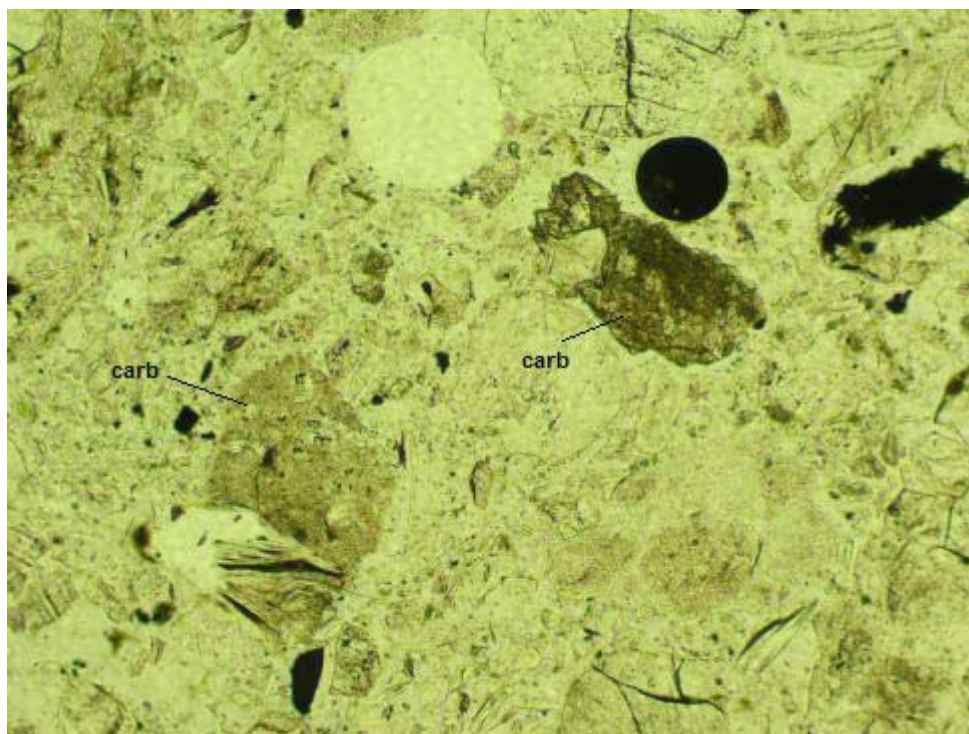


D

**K08-24-12-15:** C) Representative view of pervasively sericite-altered granitoid. XPL, FOV  $\approx$  4.5 mm, D) Patchy brown carbonate aggregate within granitoid chip. XPL, FOV  $\approx$  1.3 mm

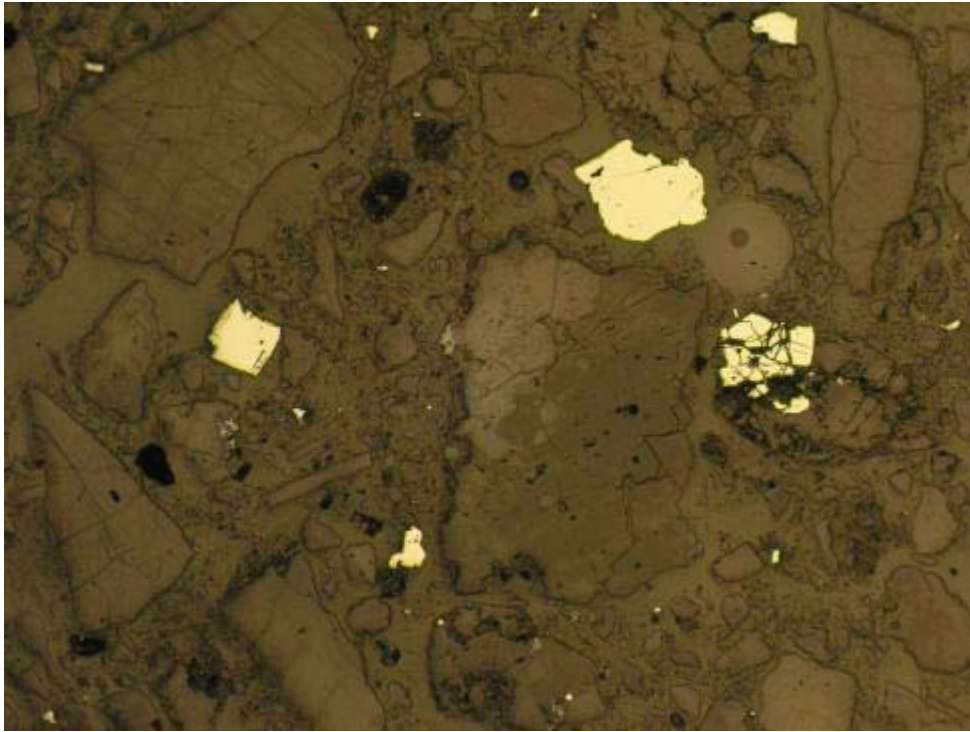


E

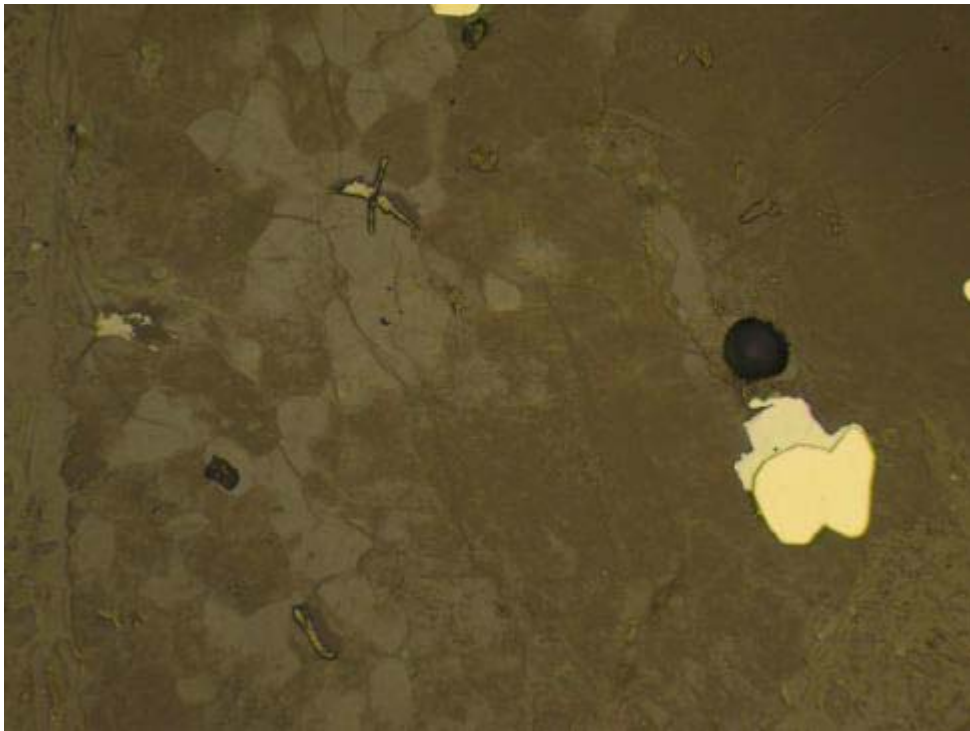


F

**K08-24-12-15:** E) Brown carbonate aggregate as fracture infill. XPL. FOV  $\approx$  0.7 mm. F) Liberated aggregate of colourless carbonate (left) and brown carbonate (right). PPL. FOV  $\approx$  1.3 mm.

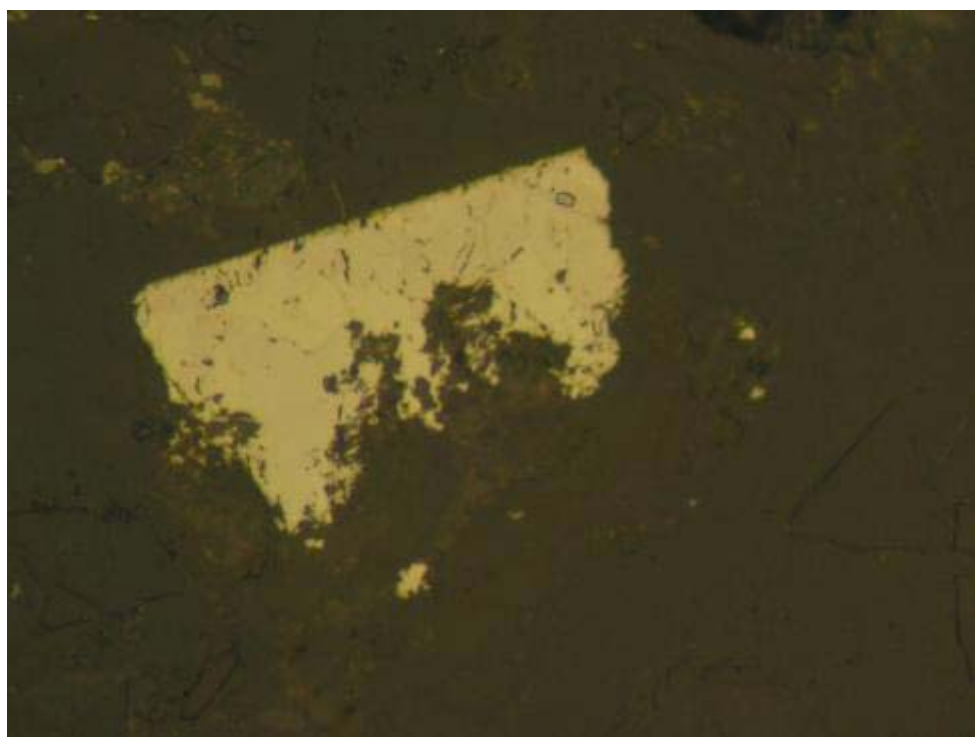


G



H

**K08-24-12-15:** G) Distribution of pyrite within granitoid fragments and as liberated grains. RL. FOV  $\approx$  2.6 mm. H) Granitoid fragment with grains of molybdenite (left) and pyrite partly enclosed by galena (right). RL. FOV  $\approx$  0.3 mm.



**K08-24-12-15:** I) Liberated unknown phase with irregular rim without secondary products. RL. FOV  $\approx$  0.2 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: K08-24-144-147

Offcut #: BD-5

**Chip and Offcut Mount Description:**

Fine to coarse angular chips (less than 8 mm size) and finely crushed grains. Chips include fine-grained leucocratic granitoid with minor pyrite and quartz veins with traces of molybdenite. No reaction of chips to cold, dilute HCl but reaction of very fine-grains to HCl. No reaction of chips to magnet. Reaction of some fragments to etching with HF and staining with sodium cobaltinitrite (yellow stain ~35% alkali feldspar).

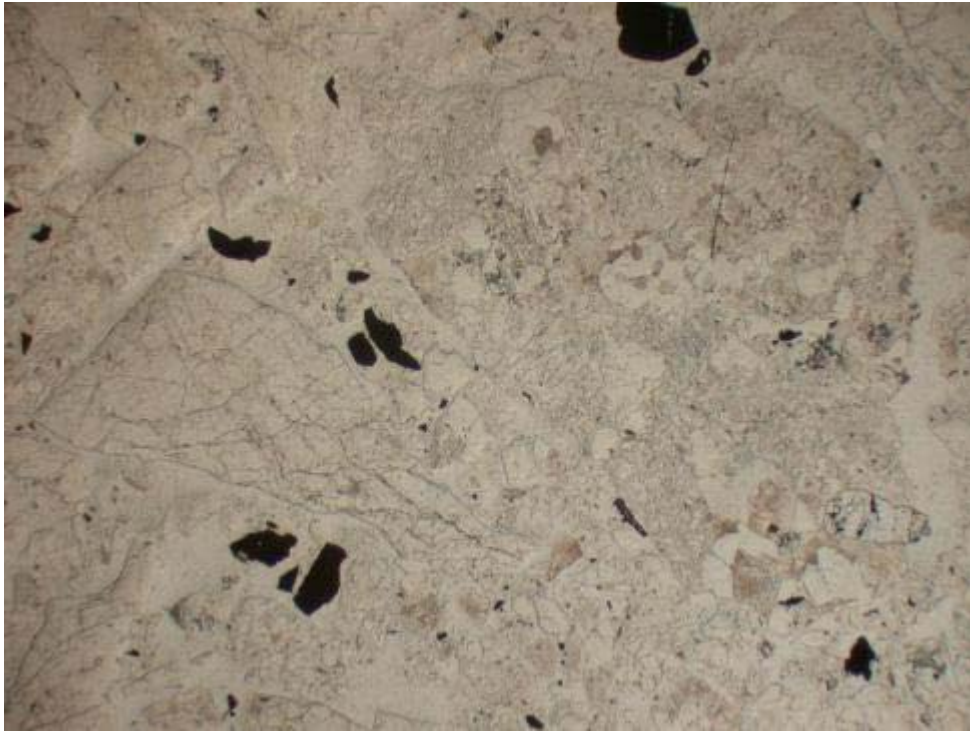
**Polished Thin Section Description:**

Fine to coarse chips representing fine to medium-grained leucocratic granitoid, quartz veinlets and abundant liberated grains including quartz, K-feldspar, pyrite and lesser sericite, biotite and carbonate. The leucocratic granitoid composition varies from fragment to fragment but typically includes fine to medium-grained K-feldspar, quartz, variably sericite altered plagioclase and rarely biotite. Locally the granitoid fragments are porphyritic with fine to medium-grained phenocrysts altered plagioclase in a finer-grained K-feldspar-quartz groundmass (< 0.2 mm). Plagioclase and sericite each comprise approximately 5% of the section. Biotite, brown, occurs in trace amounts (< 0.4 mm) as liberated plates and rarely in granitoid fragments. Quartz within veinlets is anhedral and fine to medium-grained (< 2 mm). Quartz comprises approximately 45% of the section. Fine-grained apatite, titanite and rare zircon occur as accessory phases in the granitoid chips. Traces of Ti-oxide occurs as patchy aggregates in granitoid fragments and as replacement of former biotite.

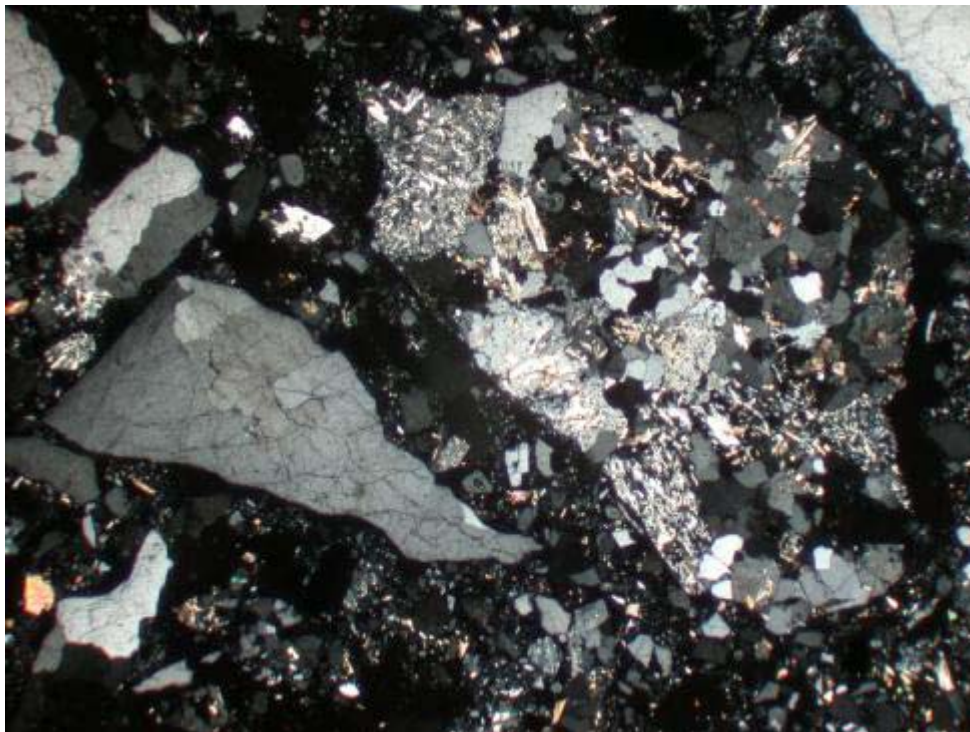
Carbonate occurs in minor amounts (~2%) as colourless carbonate. Colourless carbonate occurs as fine liberated grains (< 0.7 mm), as fine to very fine-grained (< 0.2 mm) irregular patchy aggregates within granitoid fragments and as fracture infill. Traces of red-brown Fe-ox occur rarely partly replacing carbonate aggregate.

Sulphide occurs in major amounts, approximately 7%, as pyrite with rare traces of galena, molybdenite, sphalerite, chalcopyrite and a rare unknown phase. Pyrite, approximately 6%, occurs dominantly as liberated anhedral grains (< 2 mm) and less commonly disseminated as anhedral grains and aggregates in leucocratic granitoid chips. Pyrite grain boundaries vary from straight to irregular. Pyrite rims are unaltered. Pyrite grains rarely contain inclusions of chalcopyrite, pyrrhotite or sphalerite. Rare galena (1.2 mm) occurs in a granitoid chip and as liberated grains. Rare platy molybdenite (< 0.15 mm) occurs as liberated plates and within granitoid fragments. Rare sphalerite (< 0.3 mm) and chalcopyrite (< 0.15 mm) occur as liberated grains. The unknown phase occurs as very fine-grained anhedral aggregates with the optical properties of arsenopyrite. Fragments of the unknown phase have irregular grain boundaries with a rimmed appearance without secondary products.

Red-brown Fe-ox grains occurs very rarely as replacement of carbonate (observed only in 2 fragments).

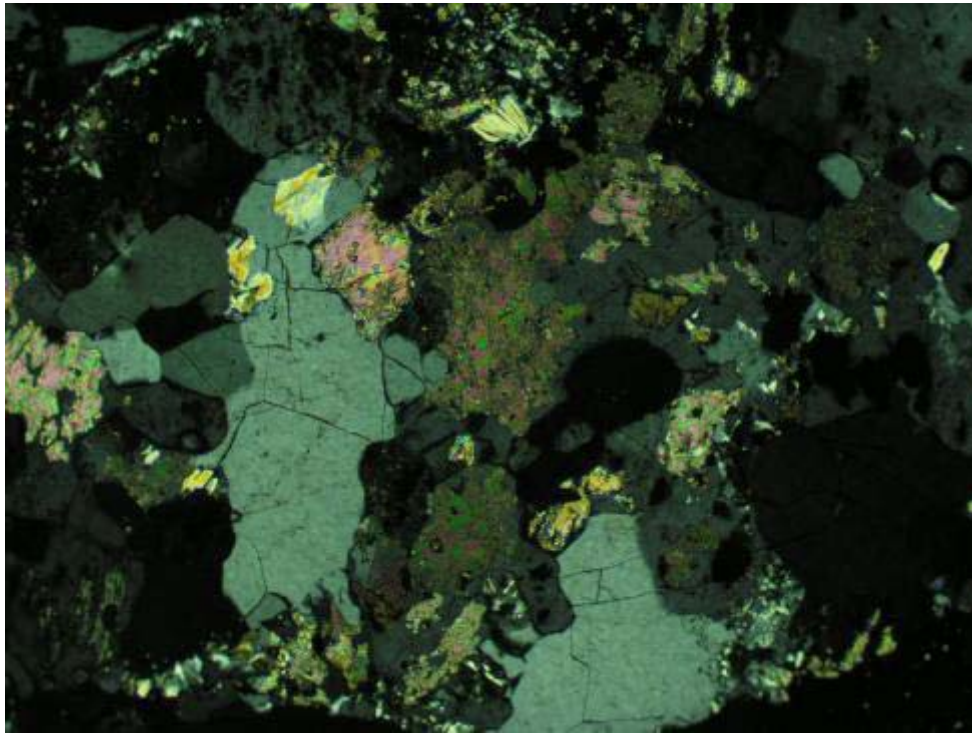


A

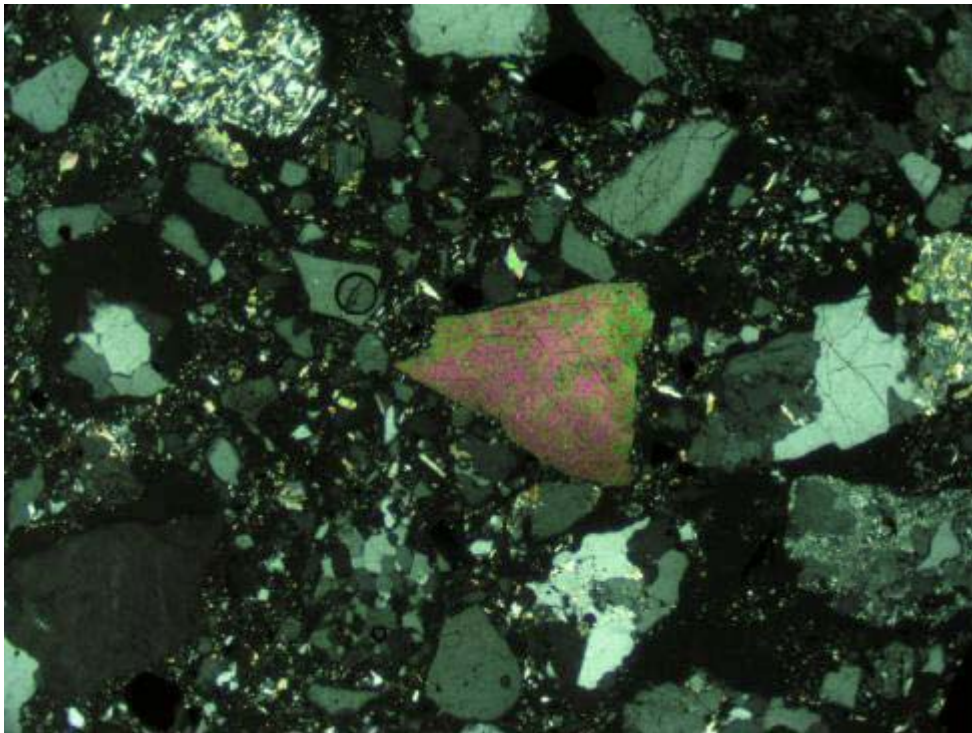


B

**K08-24-144-147:** A) Representative chips of quartz vein fragments (left) and sericite-altered granitoid fragment (right). A) PPL, B) XPL, FOV  $\approx$  4.5 mm.

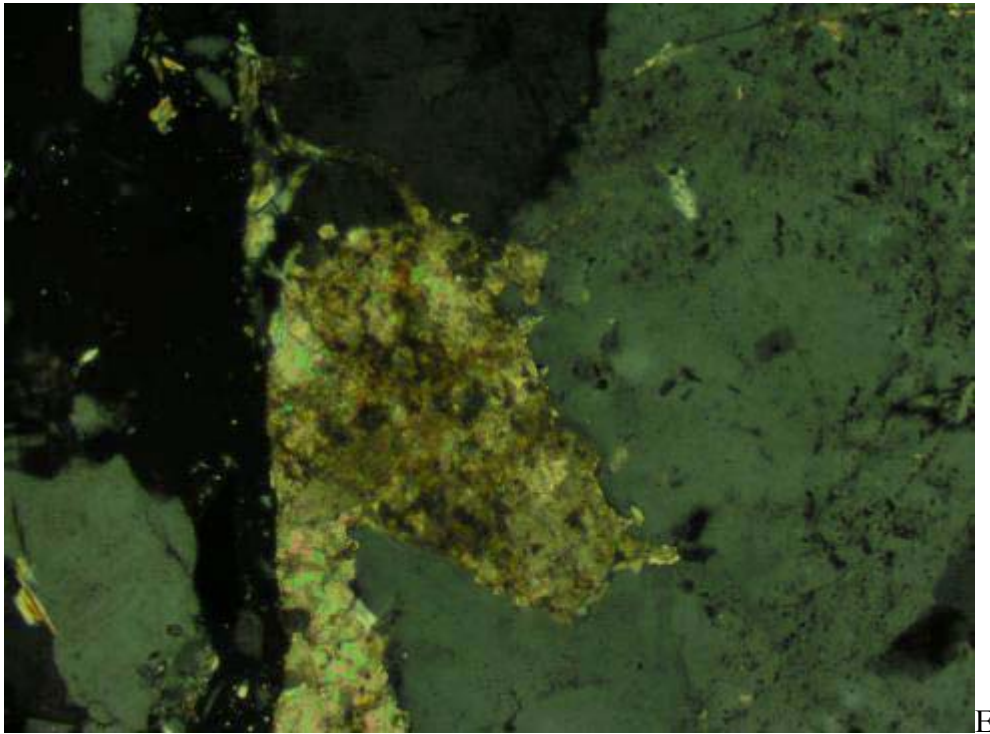


C

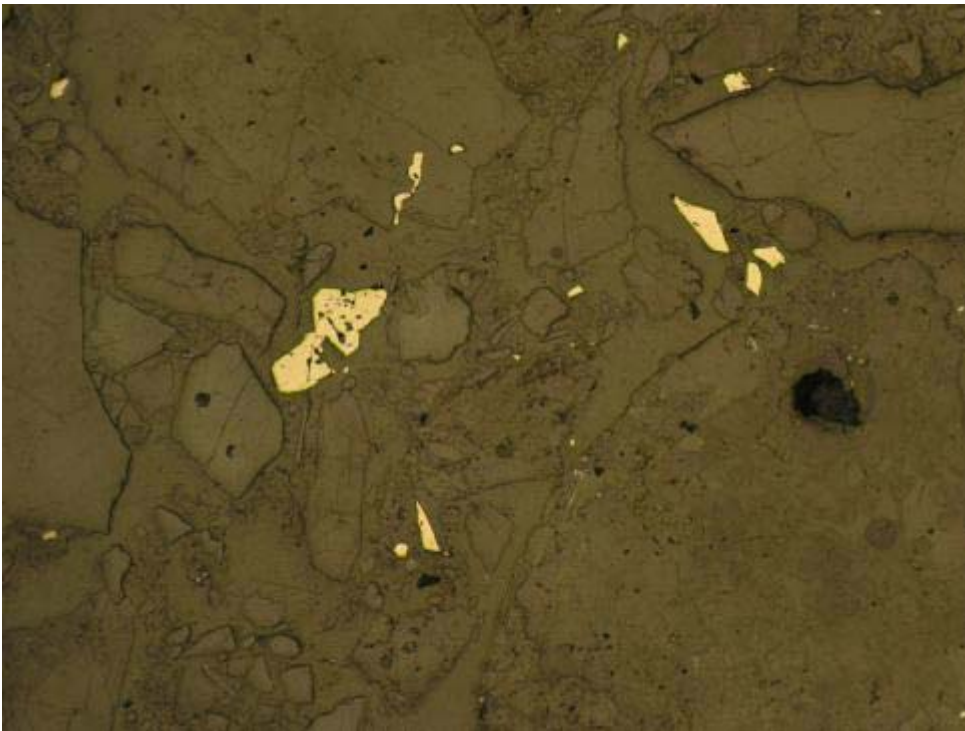


D

**K08-24-144-147:** C) Patchy carbonate within granitoid fragment. XPL, FOV  $\approx$  1.3 mm, D) Liberated carbonate grain (centre). XPL, FOV  $\approx$  2.6 mm

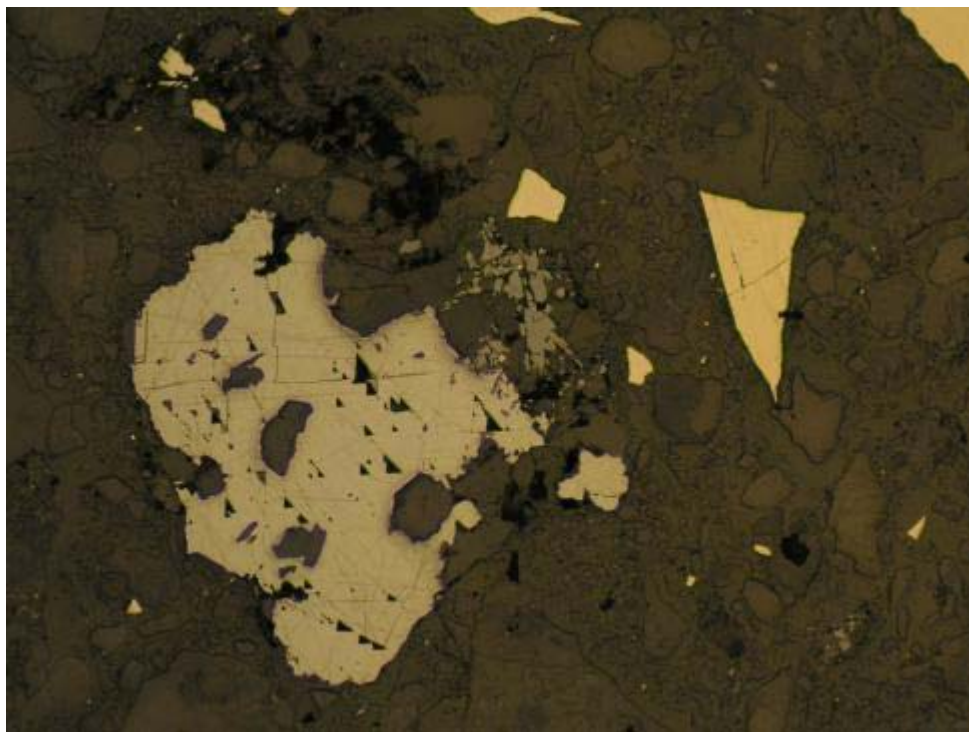


E

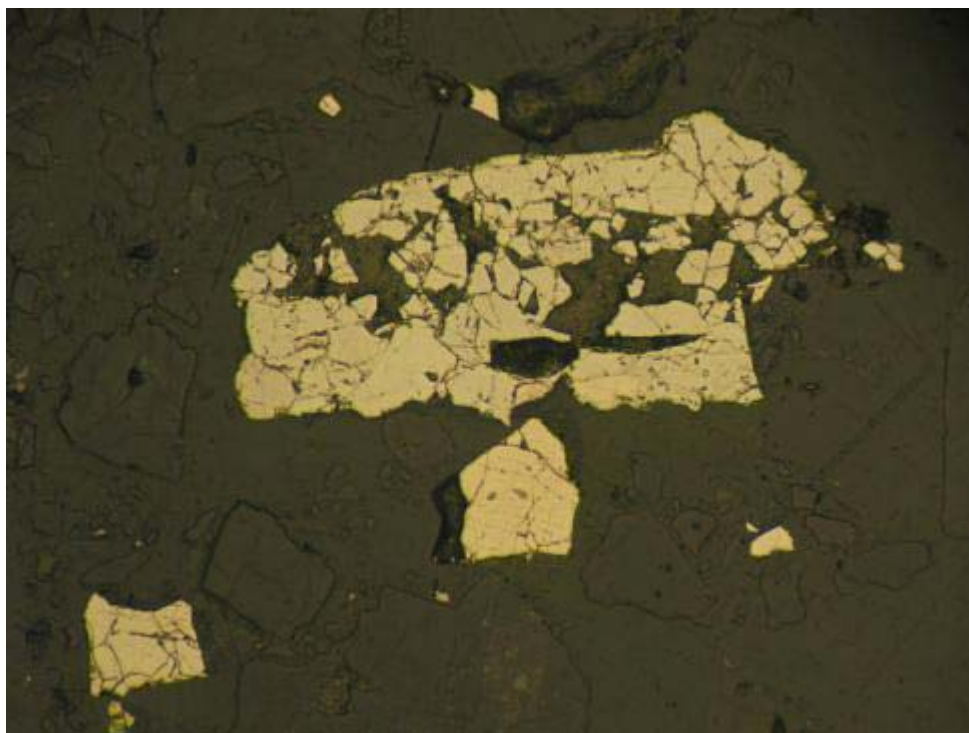


F

**K08-24-144-147:** E) Patchy carbonate partly replaced by rare traces of red-brown Fe-ox. XPL. FOV  $\approx$  0.7 mm.  
F) Typical distribution of liberated anhedral pyrite grains and pyrite within rock fragment. RL. FOV  $\approx$  2.6 mm.



G



H

**K08-24-144-147:** G) Galena and aggregate of prismatic Ti-oxide within granitoid fragment. Liberated pyrite grains (right). RL. FOV  $\approx$  2.6 mm. H) Liberated aggregate of unknown phase with irregular boundaries (centre). Two pyrite grains (below centre and left). RL. FOV  $\approx$  0.4 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: K08-28-30-33

Offcut #: BD-4

**Chip and Offcut Mount Description:**

Fine to coarse angular chips (less than 10 mm size) and very fine grains. Chips include aphanitic medium dark grey biotite hornfels with minor disseminated pyrrhotite/pyrite. No reaction of chips to cold, dilute HCl but strong reaction of fine grains to HCl. No reaction of chips to magnet but minor reaction of fine grains to magnet. Reaction of some fragments to etching with HF and staining with sodium cobaltinitrite (yellow stain ~20% alkali feldspar).

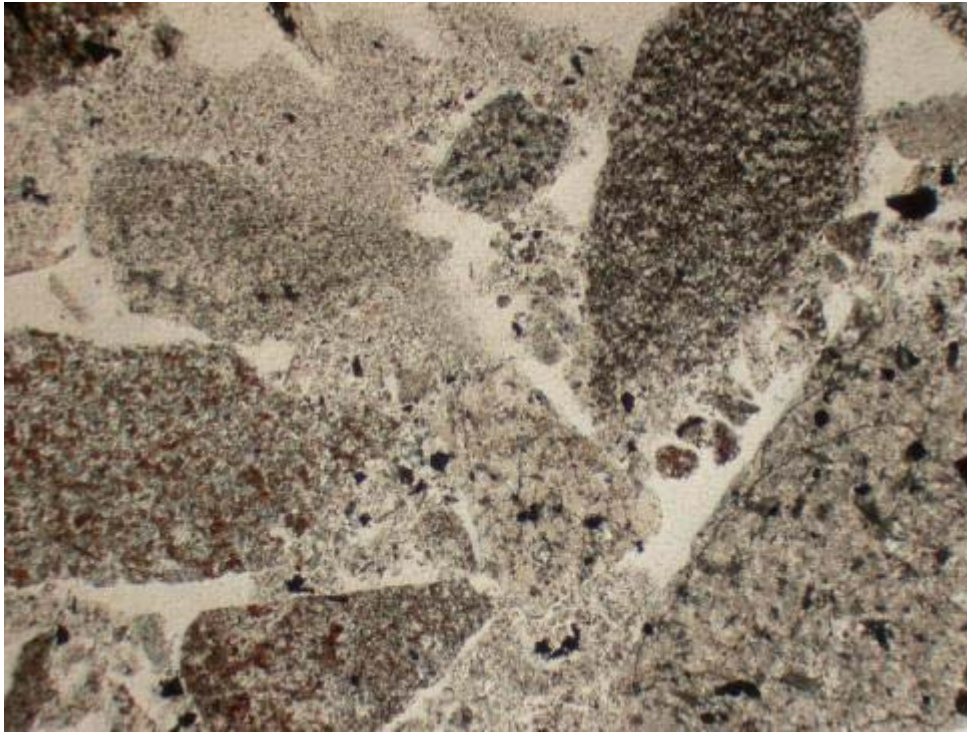
**Polished Thin Section Description:**

Fine to coarse chips representing very fine-grained biotite hornfels, less commonly pervasively sericite± carbonate or carbonate altered hornfels, quartz±K-feldspar±carbonate±sulphide veinlets, carbonate veinlets, quartz veinlets, K-feldspar veinlets, rare very fine-grained quartz-epidote aggregate with disseminated pyrite as well as liberated grains of quartz, biotite and pyrite. The biotite hornfels has a granoblastic to locally foliated texture and comprises very fine-grained quartz, cloudy feldspar, subhedral brown biotite and locally disseminated pyrrhotite and less commonly pyrite. Biotite is partly replaced by traces of chlorite in some fragments. In some chips, biotite and some feldspar are replaced by sericite± carbonate ± Ti-oxide aggregate. Biotite occurs in major amounts in the section (~8%). Sericite occurs in minor amounts (~3%). Relict very fine-grained feldspar in the hornfels, likely plagioclase, occurs in major amounts (~20%). Quartz comprises approximately 40% of the section.

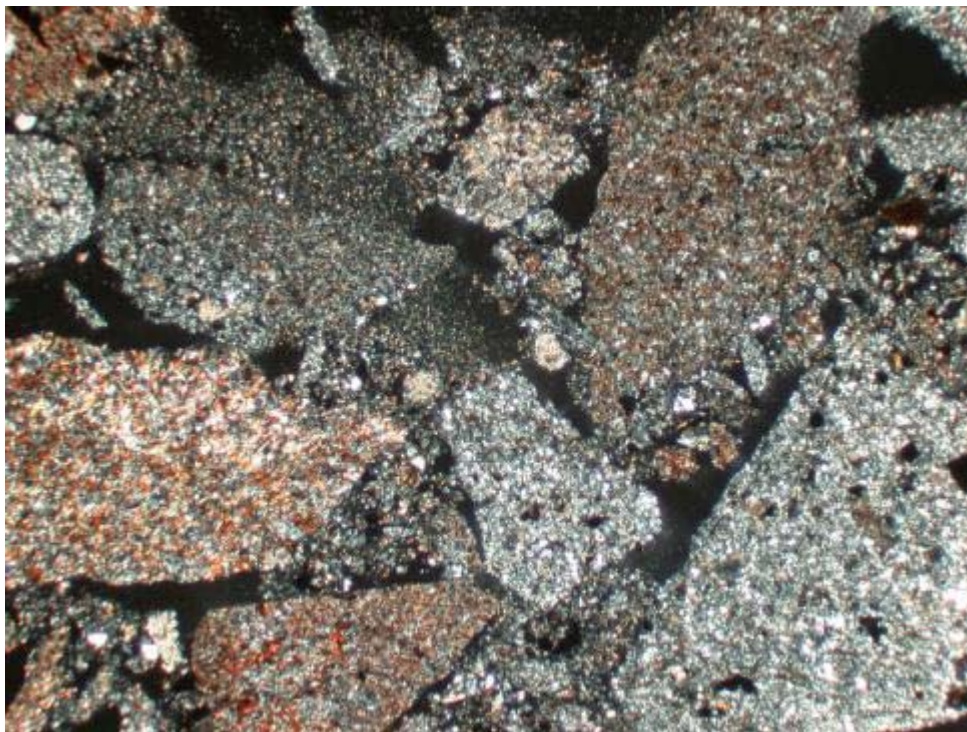
Carbonate occurs in minor amounts (~4%) as colourless carbonate, pleochroic cloudy carbonate and rarely brown carbonate. Colourless carbonate occurs as medium-grained veinlets, as very fine-grained aggregates within K-feldspar±quartz veins and as fine liberated grains and aggregates. Pleochroic cloudy carbonate occurs as patchy aggregates within sericite-carbonate and carbonate altered hornfels. Brown carbonate occurs rarely as very fine-grained nodular aggregates forming veinlets and partly replacing colourless carbonate veinlets. Rarely colourless carbonate within quartz-pyrite-carbonate veinlets and carbonate-pyrite veinlets is partly stained and replaced by red-brown Fe-ox aggregate.

Sulphide occurs in minor amounts, ~ 4%, dominantly as pyrite and pyrrhotite with rare chalcopyrite, molybdenite and marcasite. Pyrite, ~2%, occurs typically as liberated anhedral grains (< 0.15 mm), as anhedral aggregates in quartz±carbonate veinlets (< 1 mm) or disseminated within sericite±carbonate altered hornfels or biotite hornfels. Pyrite grain boundaries vary from straight to irregular but alteration rims are absent. Pyrrhotite, 2%, occurs disseminated as fine grains (< 0.15 mm) within biotite hornfels chips. Pyrrhotite typically has irregular grain boundaries but alteration rims are absent. Rarely very fine-grained marcasite occur partly replacing pyrrhotite aggregate in one quartz vein chip. Rare very fine-grained chalcopyrite (< 0.1 mm) occur locally associated with pyrrhotite in fragments of biotite hornfels. Rare molybdenite occurs as flaky aggregates with marcasite at margins of one biotite hornfels fragment.

Rarely red-brown Fe-ox occurs partly replacing fine-grained carbonate associated with pyrite in quartz vein fragments and carbonate-pyrite veinlets.

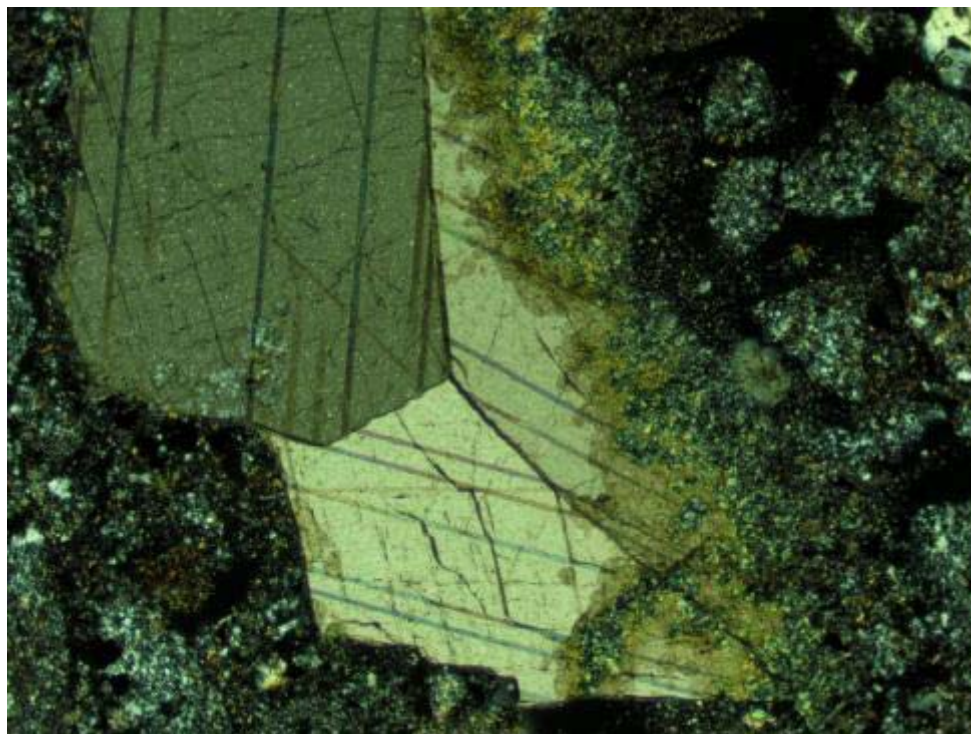


A

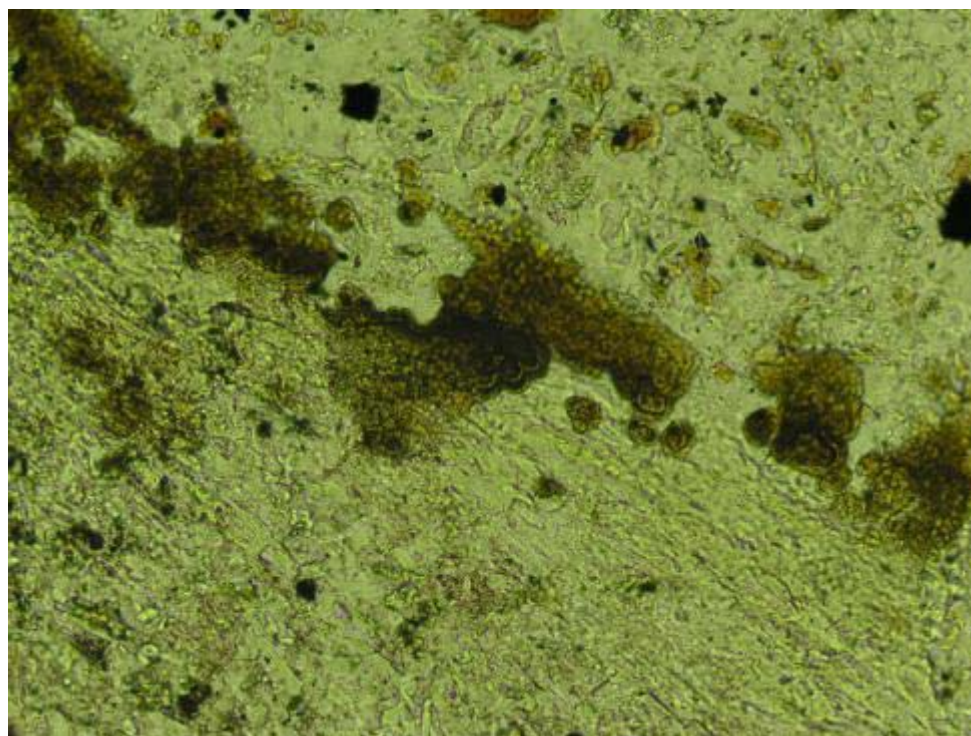


B

**K08-28-30-33:** Representative chips of very fine-grained biotite hornfels and pervasively sericite±carbonate altered hornfels. A) PPL, B) XPL, FOV ≈ 4.5 mm.

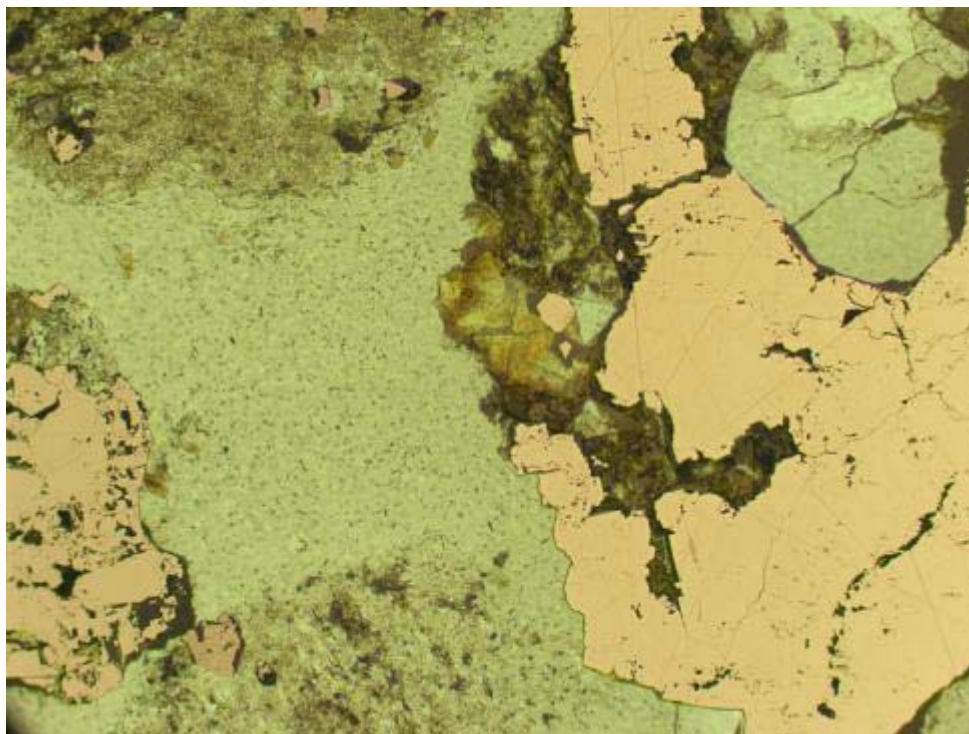


C

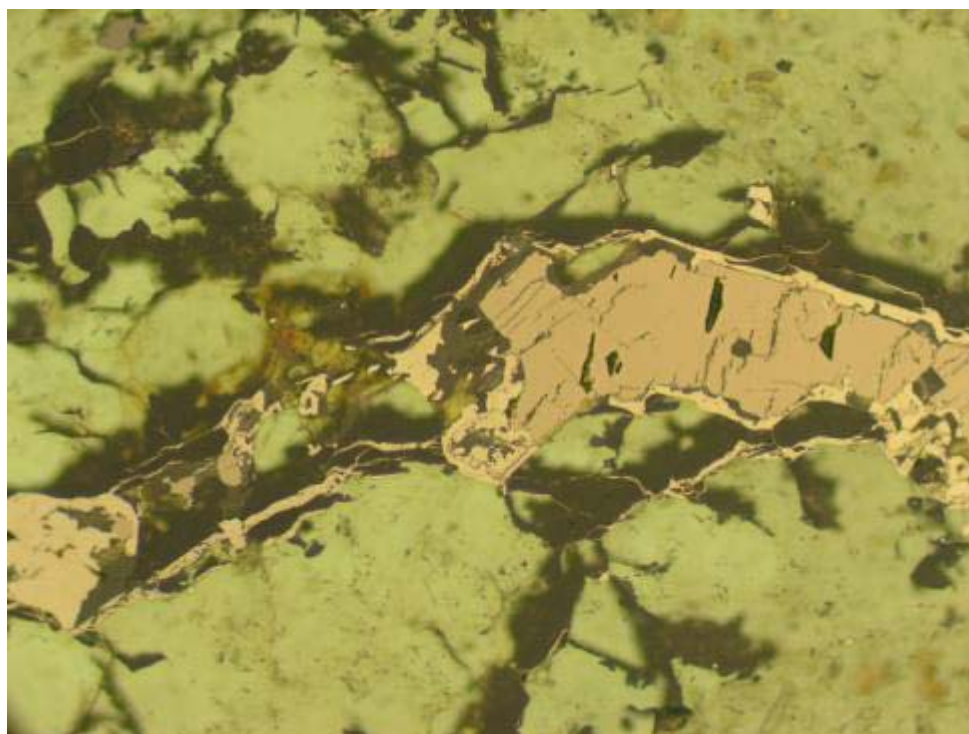


D

**K08-28-30-33:** C) Colourless carbonate veinlet with vein margins partly replaced by very fine-grained brown carbonate. XPL, FOV  $\approx$  2.6 mm, D) Very fine-grained nodular brown carbonate at margins of carbonate-sericite altered hornfels. PPL, FOV  $\approx$  0.7 mm

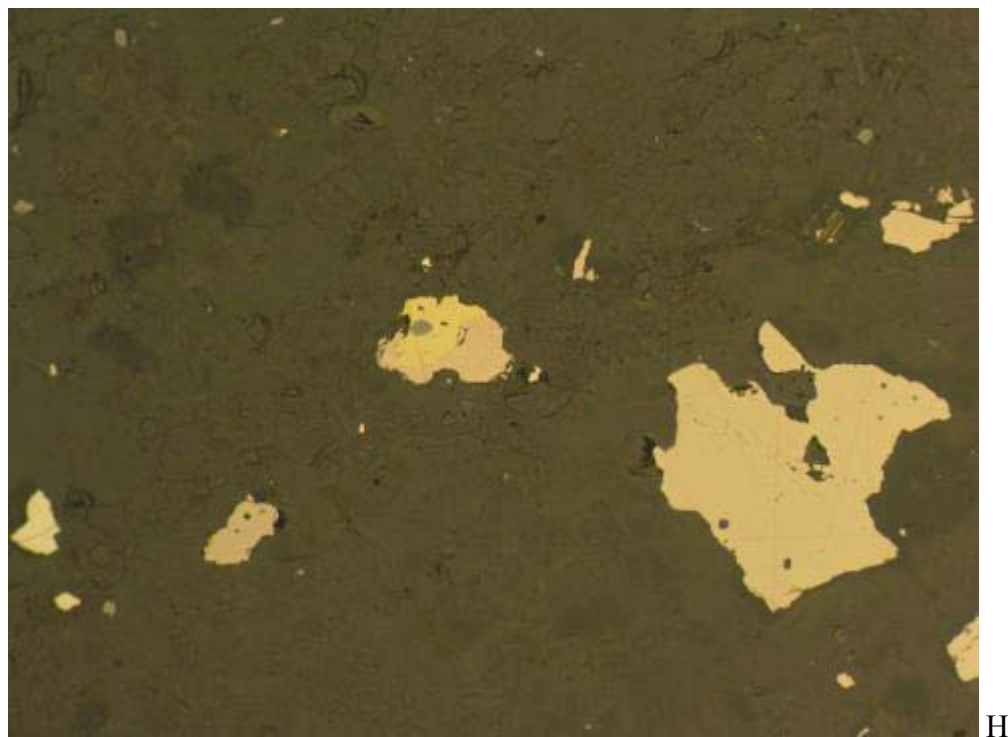
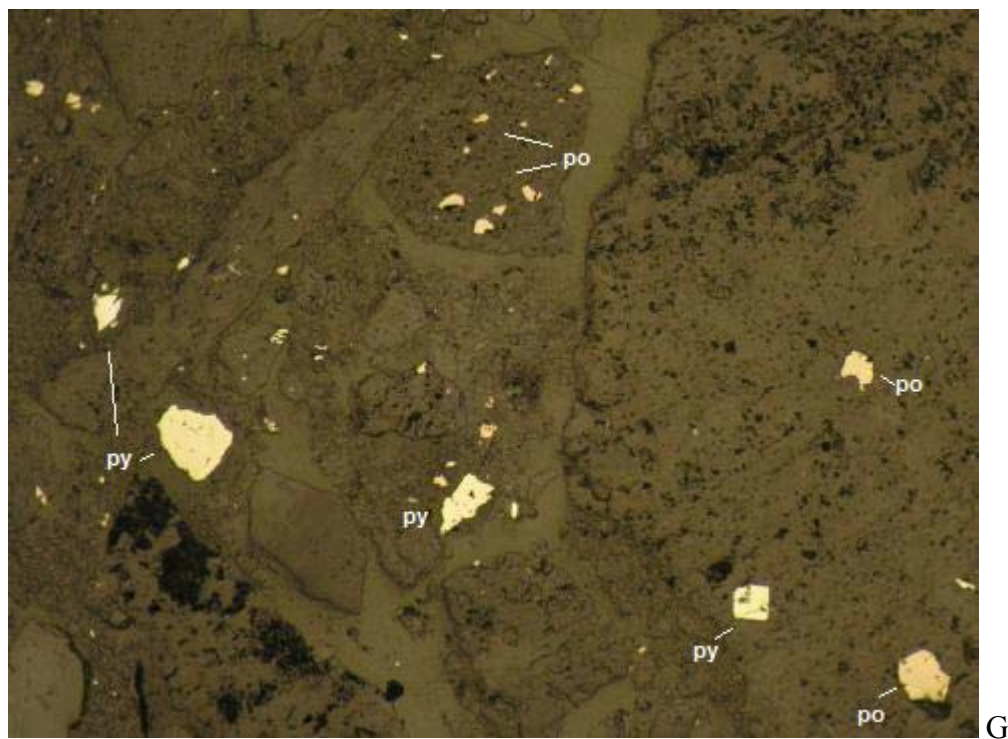


E



F

**K08-28-30-33:** E) Colourless carbonate partly replaced by red-brown Fe-ox adjacent to pyrite in quartz-pyrite-carbonate veinlet. PPL+RL. FOV  $\approx$  1.3 mm. F) Pyrrhotite rimmed by marcasite in fractured quartz veinlet with traces of carbonate partly replaced by red-brown Fe-ox. PPL+RL. FOV  $\approx$  1.3 mm.



**K08-28-30-33:** G) Distribution of pyrite and pyrrhotite grains disseminated in hornfels and as liberated pyrite grains. RL. FOV  $\approx$  2.6 mm. H) Disseminated pyrrhotite and associated chalcopyrite (centre) grains in biotite hornfels. RL. FOV  $\approx$  0.7 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: K08-30-159-162

Offcut #: BD-3

**Chip and Offcut Mount Description:**

Fine to coarse angular chips (less than 20 mm size) and finely crushed grains. Chips include fine to medium-grained leucocratic granitoid and quartz veins with minor pyrite and molybdenite. No reaction of some granitoid chips to cold, dilute HCl but trace reaction of finely crushed grains in sample to HCl. Strong reaction of some fragments to magnet. Reaction of some fragments to etching with HF and staining with sodium cobaltinitrite (yellow stain ~30% alkali feldspar).

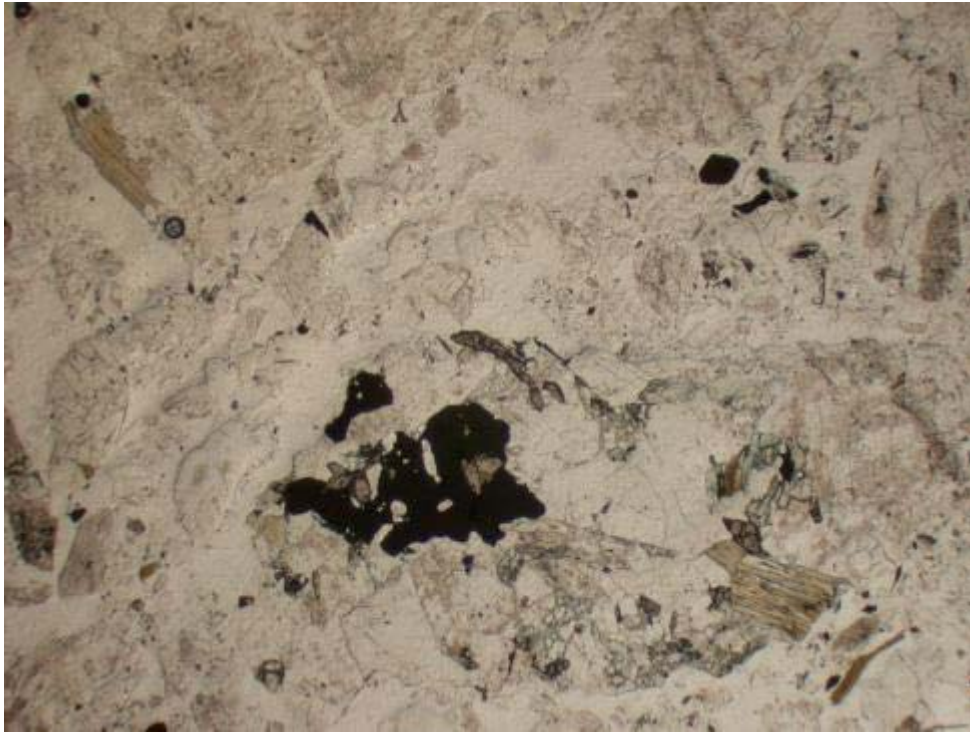
**Polished Thin Section Description:**

Fine to coarse chips representing fine to medium-grained biotite granitoid, quartz veins and abundant liberated grains including mostly quartz, K-feldspar, biotite, plagioclase and gypsum aggregate. The granitoid composition varies from fragment to fragment but typically includes fine to medium-grained quartz, altered plagioclase, K-feldspar (perthitic) and biotite with traces of titanite and apatite and locally green amphibole. Plagioclase (approximately 15% of the section) is commonly partly replaced by fine to very fine-grained sericite and locally overprinted by patchy carbonate and/or traces of epidote. Sericite comprises approximately 3% of the section. Biotite within the granitoid occurs in as fine to medium-grained (< 2 mm) green plates and aggregates. Biotite comprises approximately 5% of the section. Traces of green amphibole occur as fine-grained (< 0.3mm) liberated prismatic grains and within a few fragments of granitoid. Minor chlorite (approximately 1%) occurs locally replacing biotite and amphibole. Quartz within vein fragments is anhedral and fine to medium-grained. Quartz comprises approximately 40% of the section. Fine-grained gypsum occurs in trace amounts as fragments of liberated aggregates.

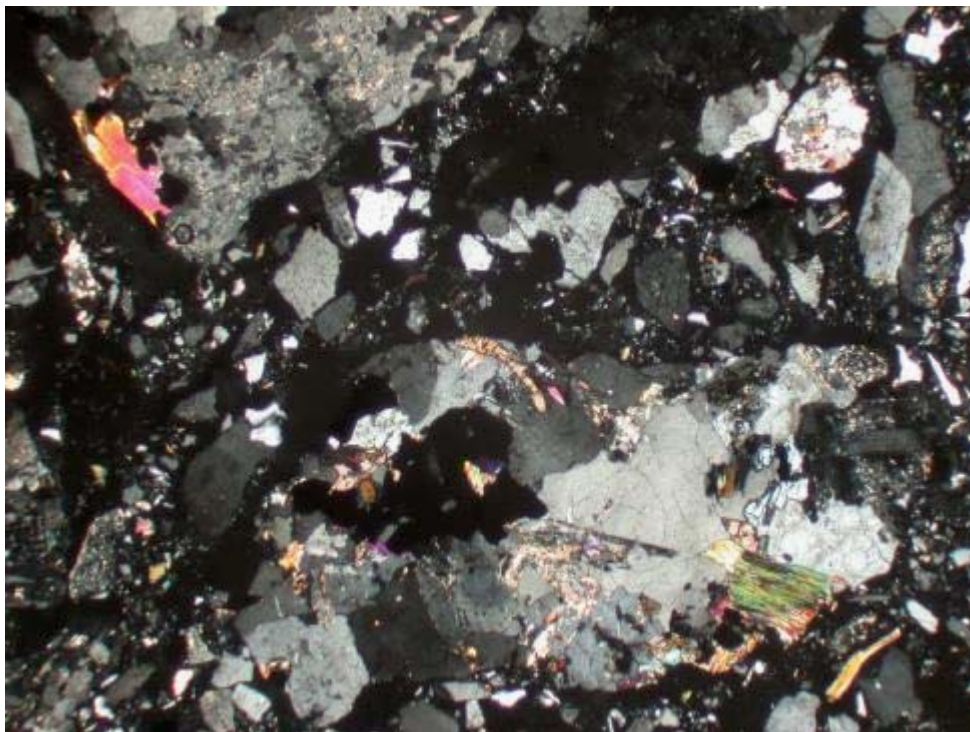
Carbonate occurs in minor amounts (~2%) as colourless carbonate. Colourless carbonate occurs as fine-grained (< 0.1 mm) subhedral to rhombic liberated grains, as fine-grained (< 0.5 mm) liberated anhedral aggregates, as fracture infill, as fine to very fine-grained aggregates forming irregular patches overprinting sericite replacement of plagioclase, as patchy replacement of biotite and rarely as patchy replacement of K-feldspar.

Sulphide occurs in minor amounts, approximately 3%, as pyrite with rare traces of molybdenite, chalcopyrite, galena and ?tetrahedrite. Pyrite, approximately 3%, occurs as liberated anhedral grains (< 0.8 mm) and disseminated as anhedral grains and aggregates in granitoid chips. Pyrite grains are unaltered. Molybdenite occurs as fine-grained (< 0.2 mm) platy grains within granitoid fragments. Rare fine grains of chalcopyrite (< 0.15 mm) occur disseminated in granitoid chips and locally enclose pyrite grains. Rare galena and tetrahedrite occur as replacement of biotite within granitoid chips; one grain of tetrahedrite occurs associated with pyrite.

Traces of magnetite occur as fine grains (< 0.15 mm) disseminated in a few granitoid chips. Magnetite grains are partly rimmed and replaced by hematite. Rare traces of red-brown Fe-ox occur as replacement of patchy carbonate aggregate.

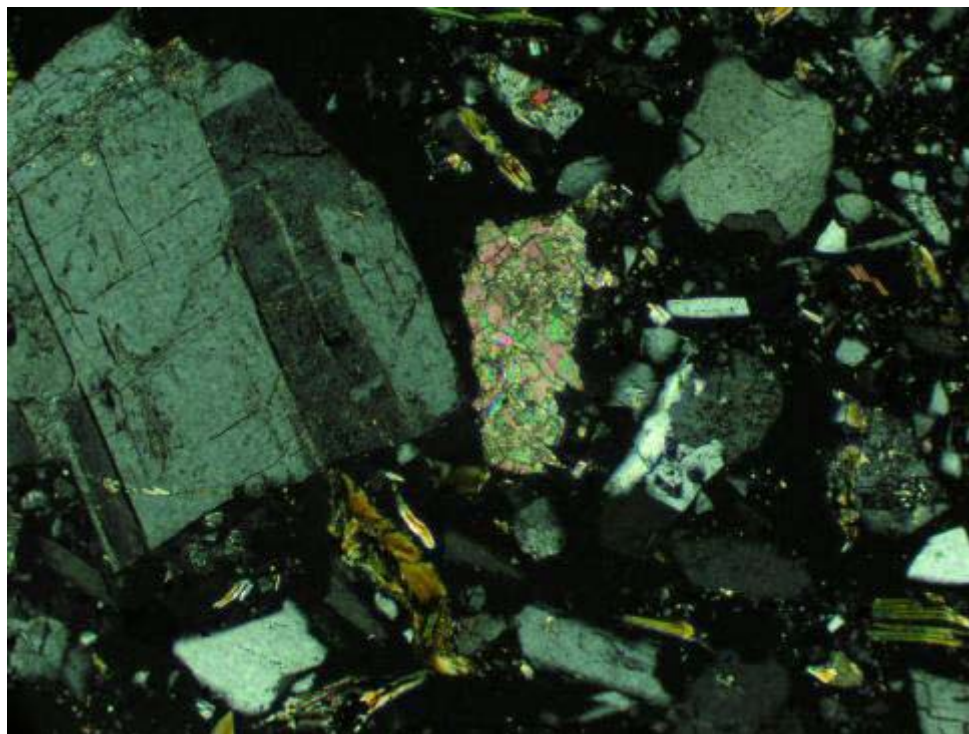


A

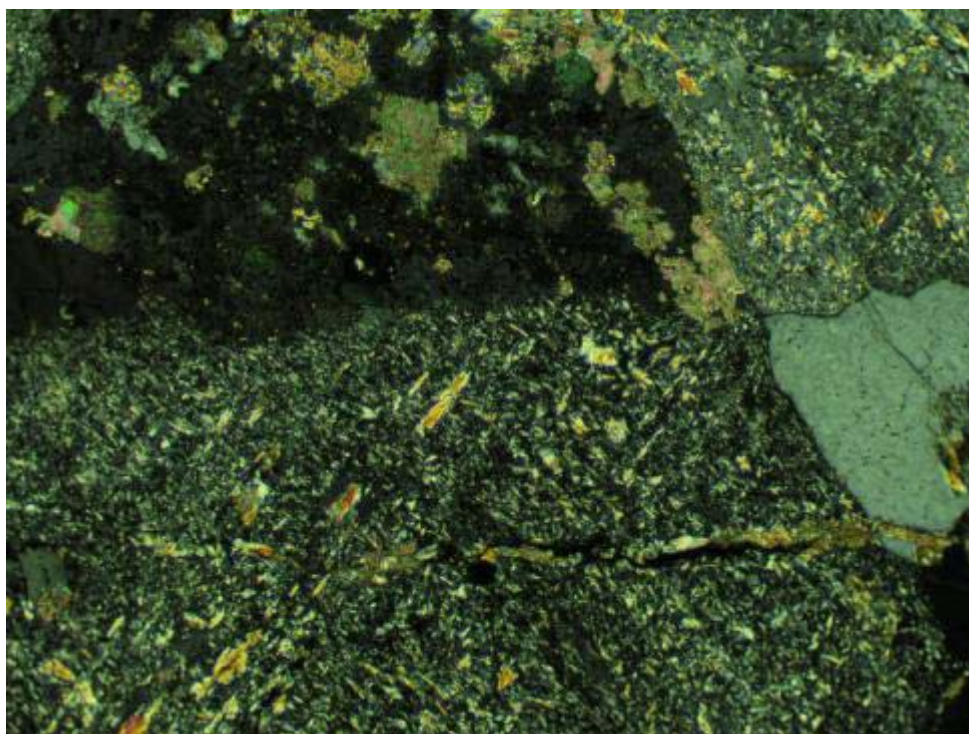


B

**K08-30-159-162:** A&B) Representative view of biotite granitoid. A) PPL, B) XPL, FOV  $\approx$  4.5 mm.

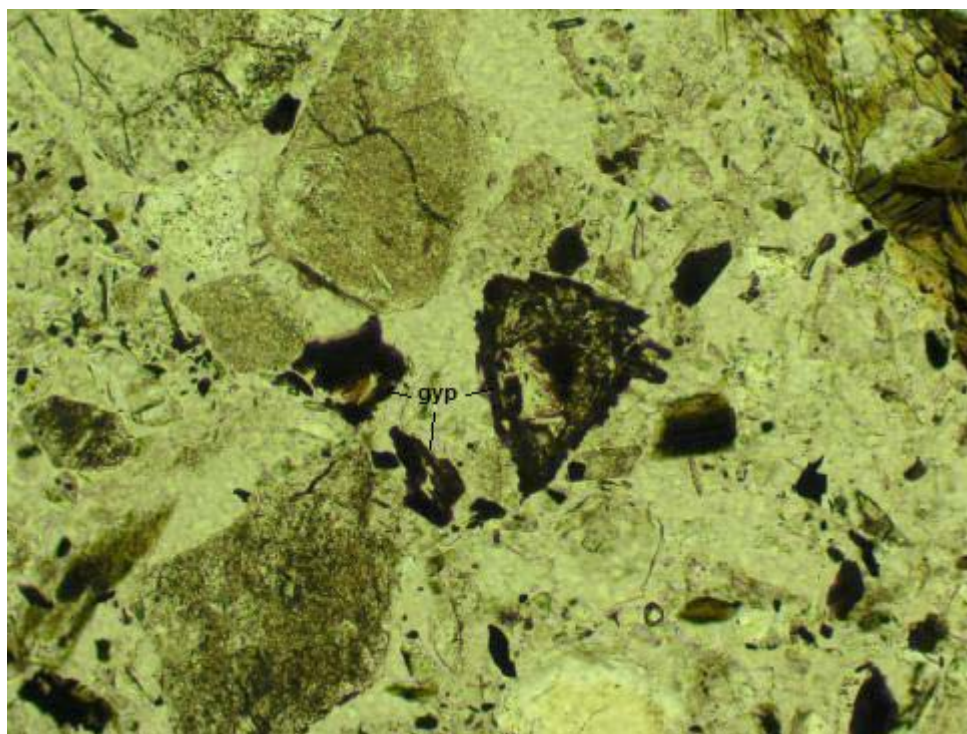
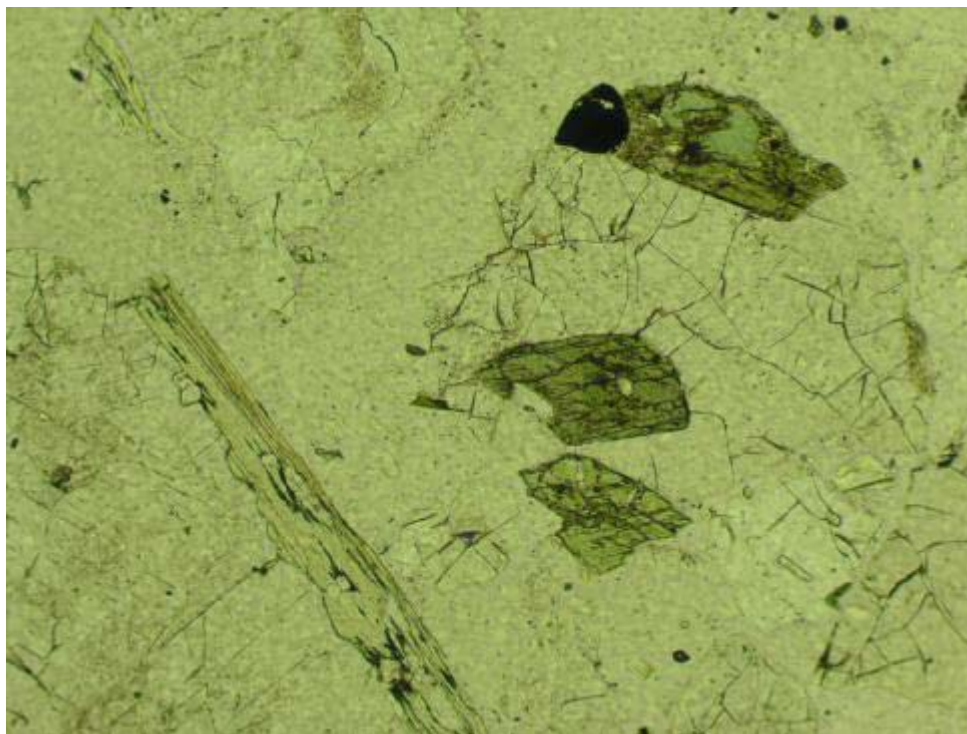


C

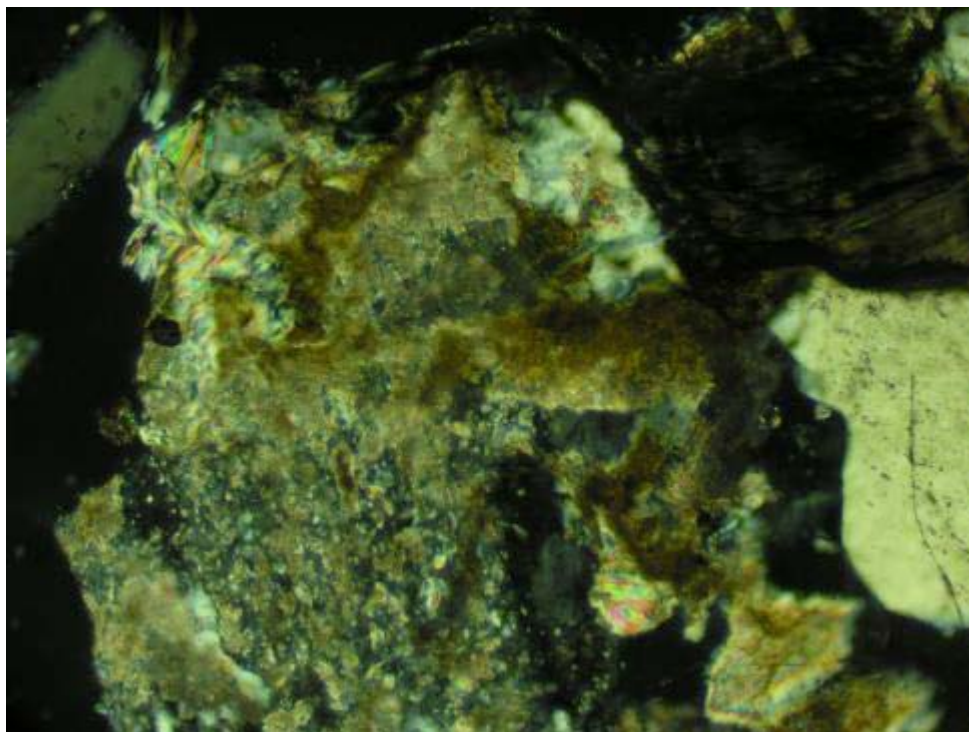


D

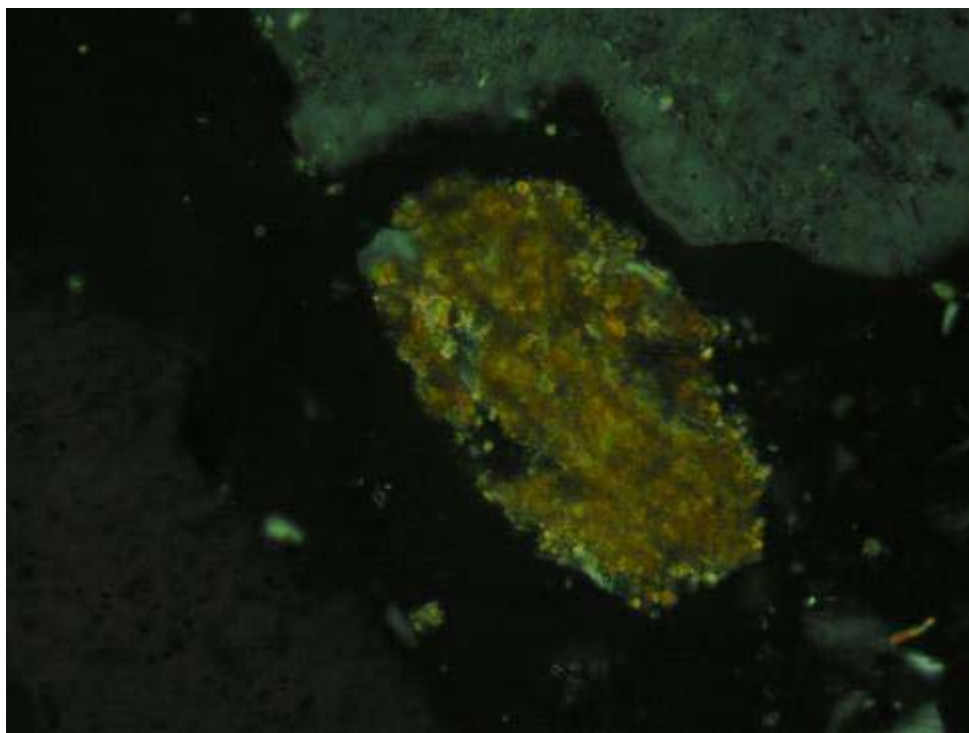
**K08-30-159-162:** C) Liberated carbonate aggregate. XPL, FOV  $\approx$  1.3 mm. D) Patchy carbonate replaces K-feldspar, selectively pervasive sericite-replacement of plagioclase and carbonate as fracture infill. XPL, FOV  $\approx$  1.3 mm.



**K08-30-159-162:** E) Grains of green amphibole (right) and biotite (left) partly replaced by chlorite. PPL. FOV ≈ 1.3 mm. F) Liberated angular gypsum aggregate. PPL. FOV = 1.3 mm.

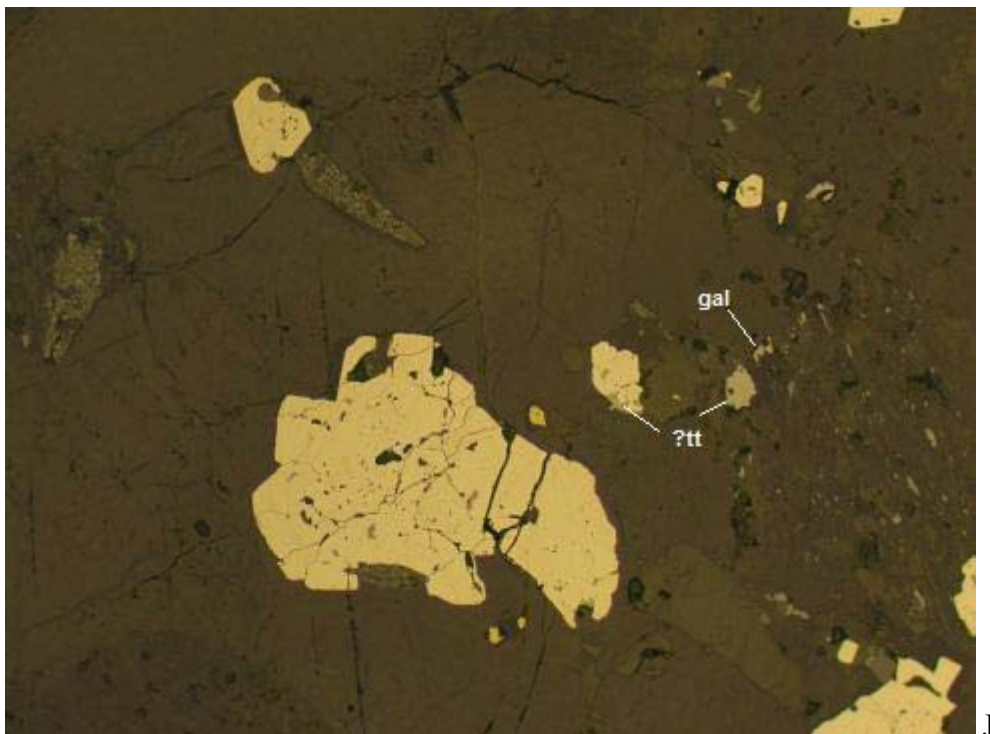
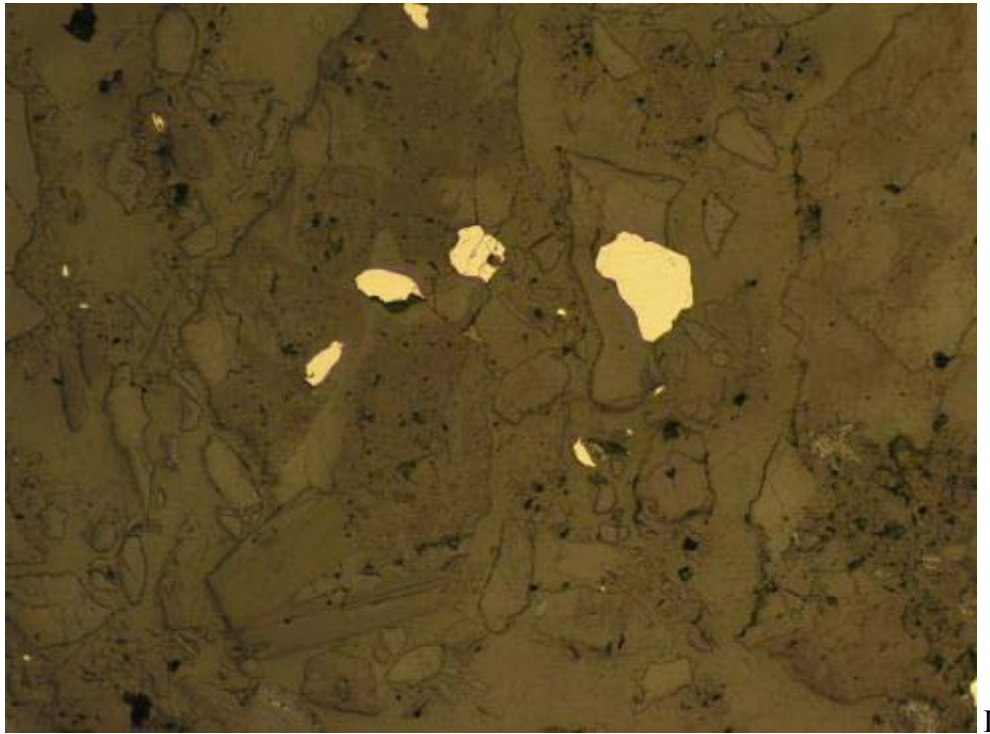


G



H

**K08-30-159-162:** G) Patchy carbonate aggregate partly replaced by red-brown Fe-ox material. XPL, condensed. FOV  $\approx$  0.7 mm. H) Liberated very fine-grained carbonate aggregate partly replaced by red-brown Fe-ox material. XPL, condensed. FOV  $\approx$  0.3 mm.



**K08-30-159-162:** I) Distribution of pyrite grains in granitoid fragments and as liberated grains. RL. FOV ≈ 2.6 mm. J) Disseminated pyrite and rare galena (gal) and ?tetrahedrite (?tt) within granitoid fragment. RL, condensed. FOV ≈ 1.3 mm.

**SGS-CEMI Project #:** 0935Avanti Mining

**Sample ID:** TP09-13-3

Offcut #: BD-2

**Chip and Offcut Mount Description:**

Medium-light grey powder and fine to coarse clumps of powder (less than 15 mm size). No reaction to magnet. Strong reaction to cold, dilute HCl. Minor reaction of some powder to etching with HF and staining with sodium cobaltinitrite (yellow stain ~2% alkali feldspar).

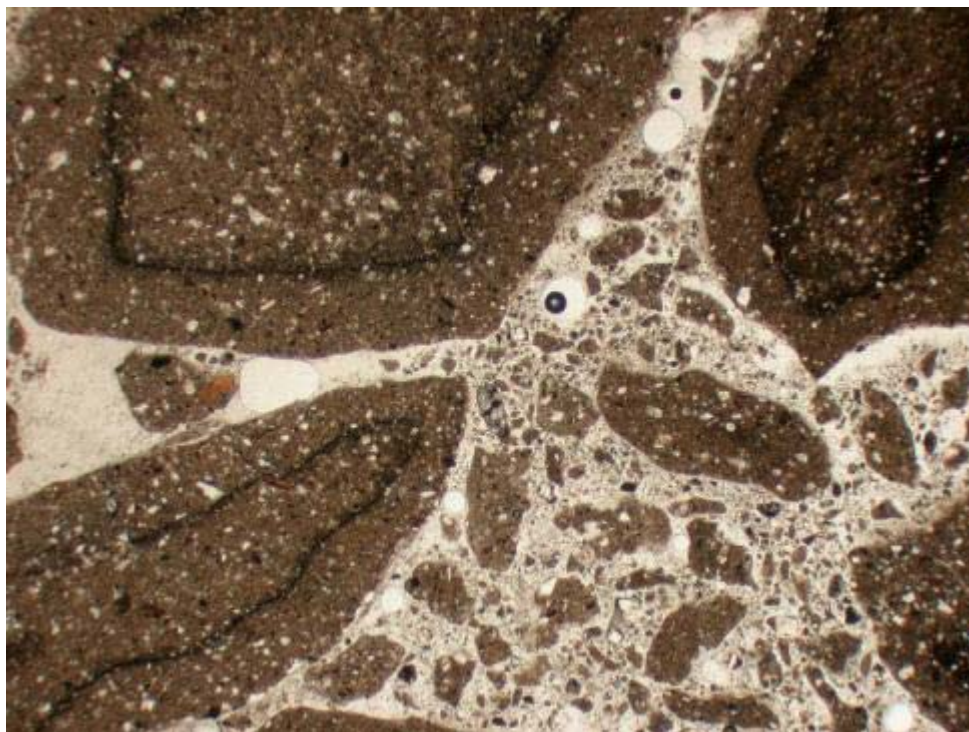
**Polished Thin Section Description:**

The section comprises numerous clumps (0.1 to 4 mm size) of fine to very fine-grains and powder and rare rock fragments including quartz-sericite-carbonate aggregate, quartz vein with clay and carbonate fracture infill and chert/silicified rock. Fine (< 0.25 mm size) and some very fine grains are distinguished optically within the clumps of powder. The grains that can be distinguished include quartz (~10%), carbonate (~15%), sericite (~5%), chlorite (~5%), minor plagioclase (~1%), biotite (~1%) and traces of pyrite and Fe-ox aggregate. Approximately 60% of material in this section is unidentified (< 0.005 mm). Many of the clumps of powder and fine grains have a dark concentric rings and or dark cores which consist of unknown aphanitic material.

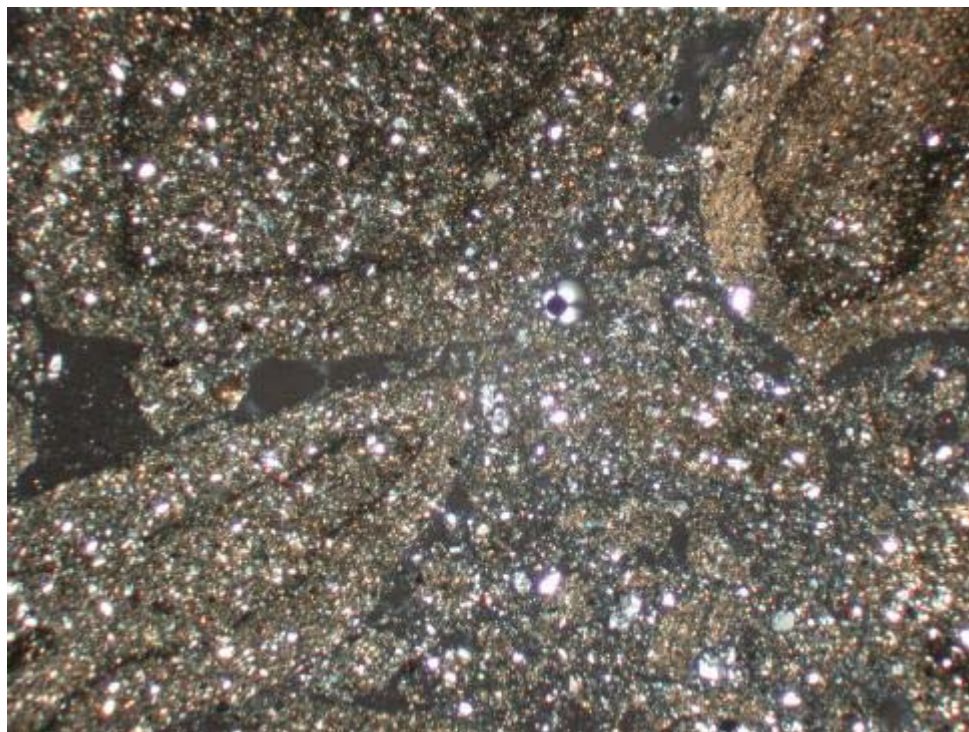
Carbonate occurs in major amounts (~15%) as colourless carbonate and rarely brown carbonate. Colourless carbonate occurs as fine-grained (< 0.2 mm) anhedral grains and anhedral very fine-grained aggregates within clumps of powder and as irregular patches in rare rock fragments. Rare brown carbonate occurs as very fine-grained aggregates within some powder clumps. Some of the carbonate in fragments must be calcite based on reaction to HCl. A few carbonate grains and aggregates are rimmed and/or partly replaced by red- brown Fe-ox.

Sulphide occurs in trace amounts close to 1% as pyrite with rare pyrrhotite and chalcopyrite. Pyrite occurs as sub-anhedral grains (< 0.1 mm) and as very fine-grained framboidal grains within powder clumps and rarely as liberated grains. Pyrite grain boundaries are irregular to straight. Pyrite rims are generally unaltered; one very fine-grained pyrite aggregate is observed with Fe-ox rims. Fine-grained anhedral pyrrhotite occurs within powder clumps. Pyrrhotite grains are unaltered. Rare fine-grained chalcopyrite occurs as very fine grains (< 0.02 mm) within powder clumps.

Traces of red-brown Fe-ox material occurs as replacement of carbonate aggregate and as very fine grains scattered within powder clumps. Orange-brown Fe-ox occurs in rare fragments as cement to plagioclase grains. Rare grains of fine-grained magnetite (~0.1 mm) and traces of ilmenite (~0.08 mm) occur as grains within powder clumps.

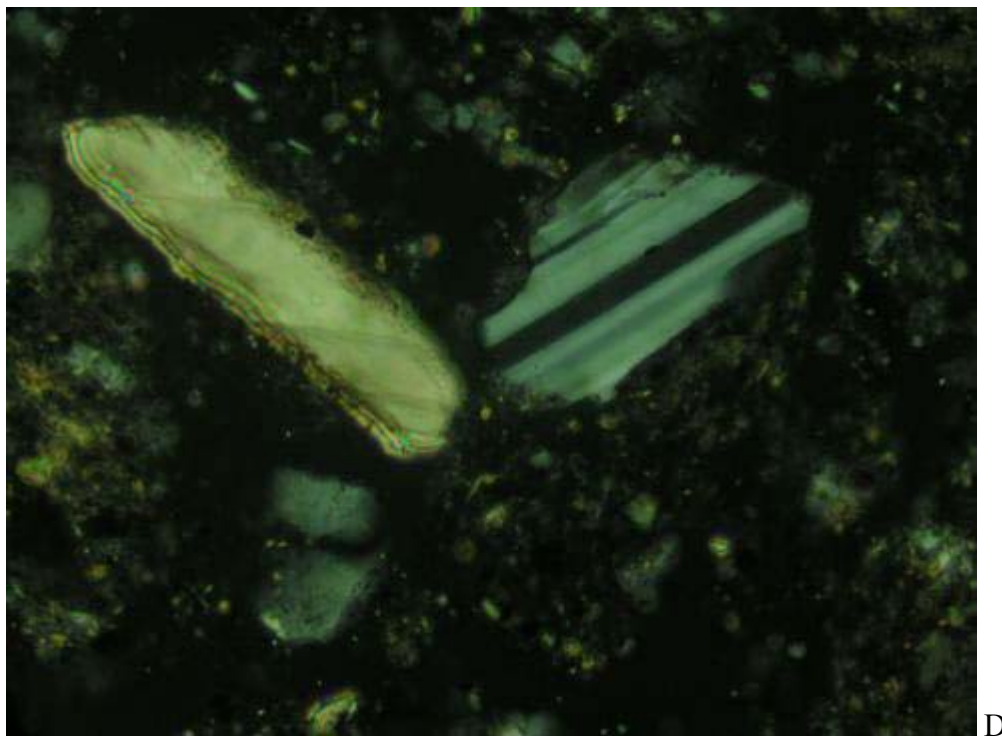
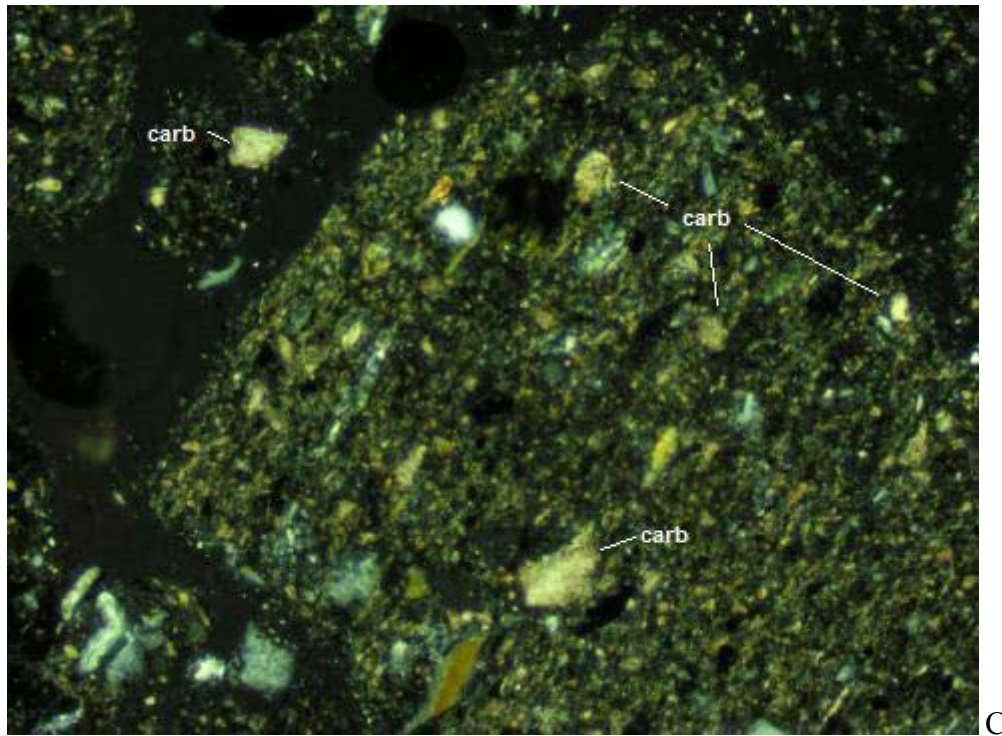


A

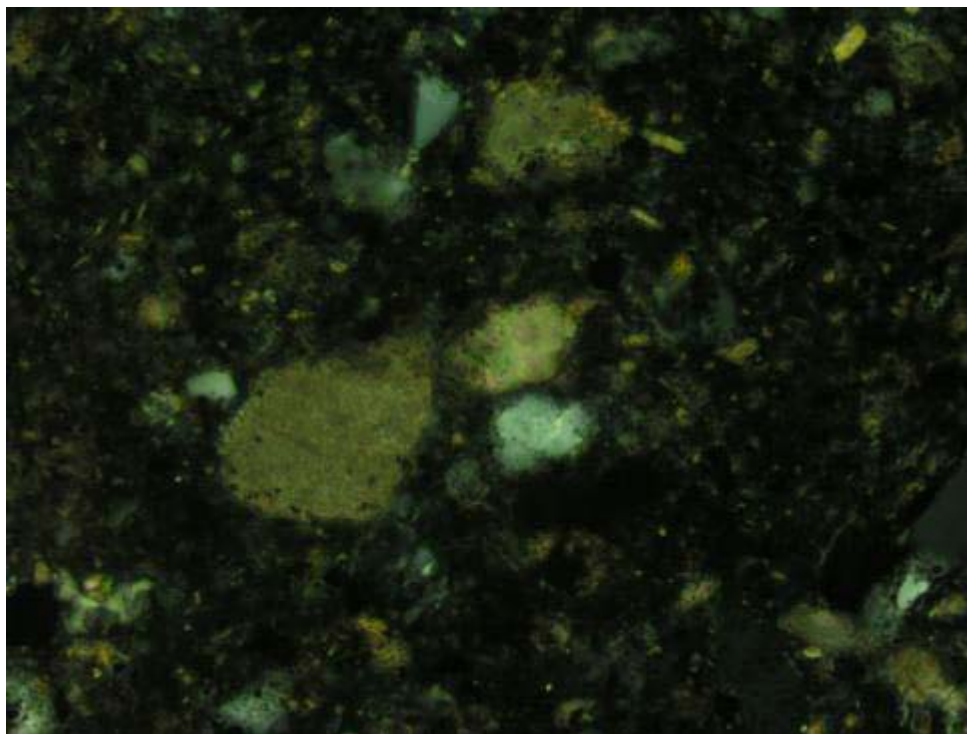


B

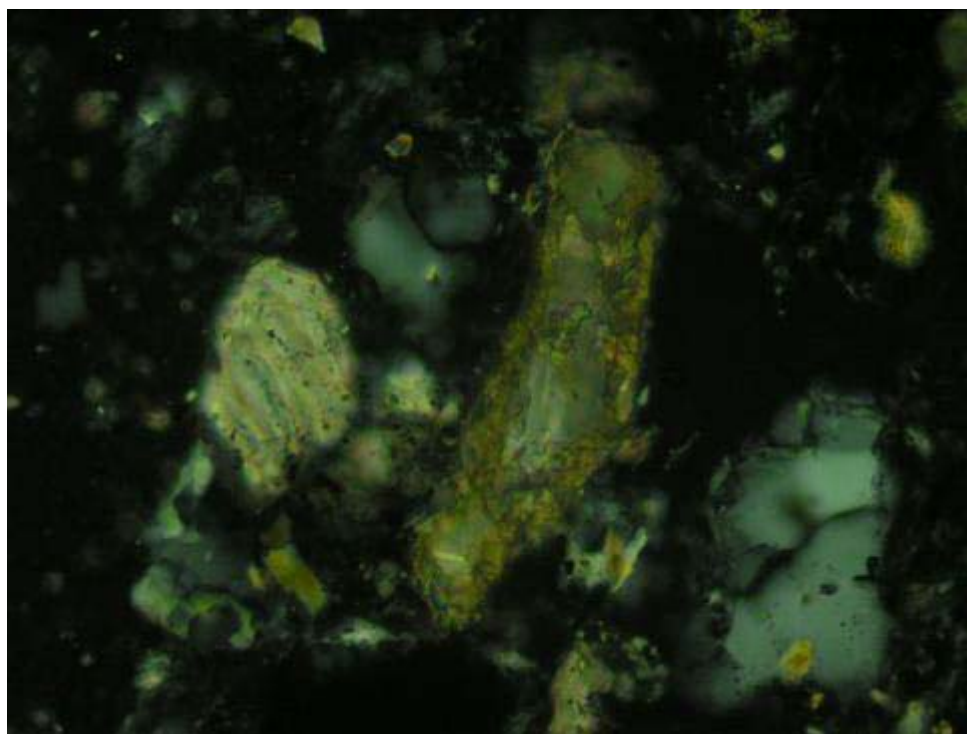
**TP09-13-3:** Representative chips of fine to very fine-grains within clumps of powder. Note dark concentric rings and or cores within powder clumps. A) PPL, B) XPL, FOV  $\approx$  4.5 mm.



**TP09-13-3:** C) Distribution of carbonate grains within powder clumps. XPL, FOV  $\approx$  0.7 mm, D) Fine grains of colourless carbonate (left) and plagioclase (right) within powder clump. XPL, FOV  $\approx$  0.3 mm

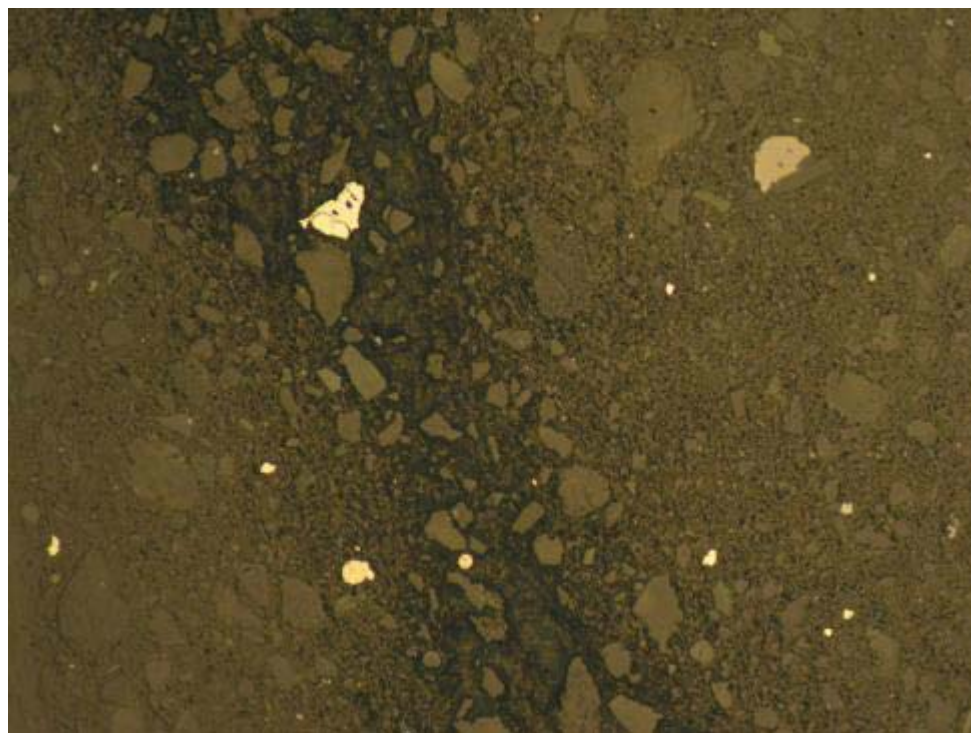
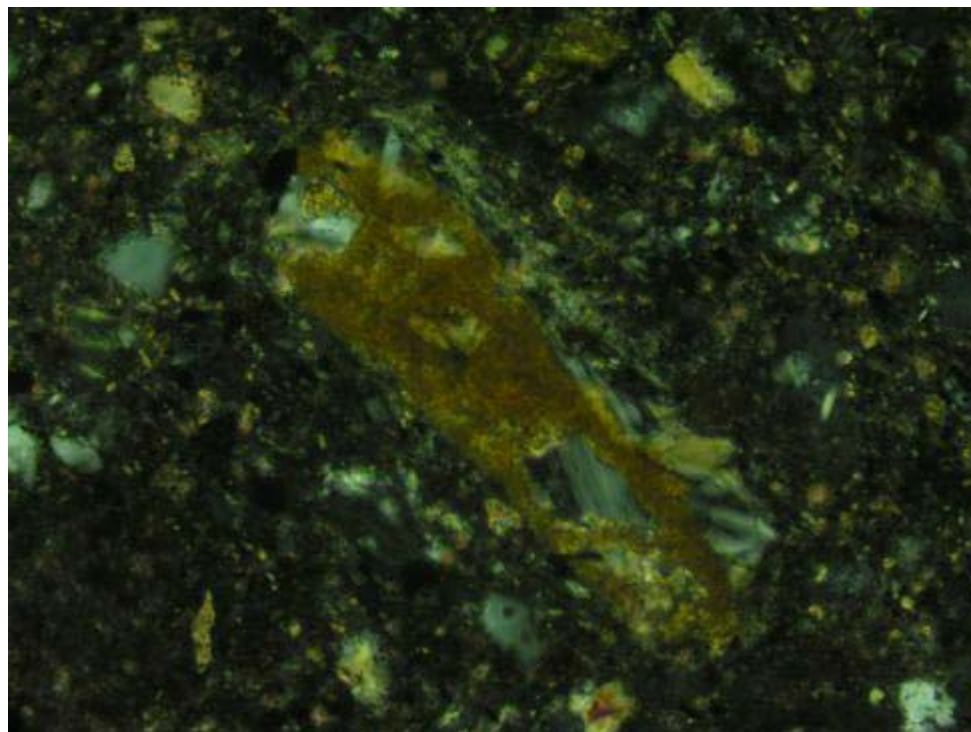


E

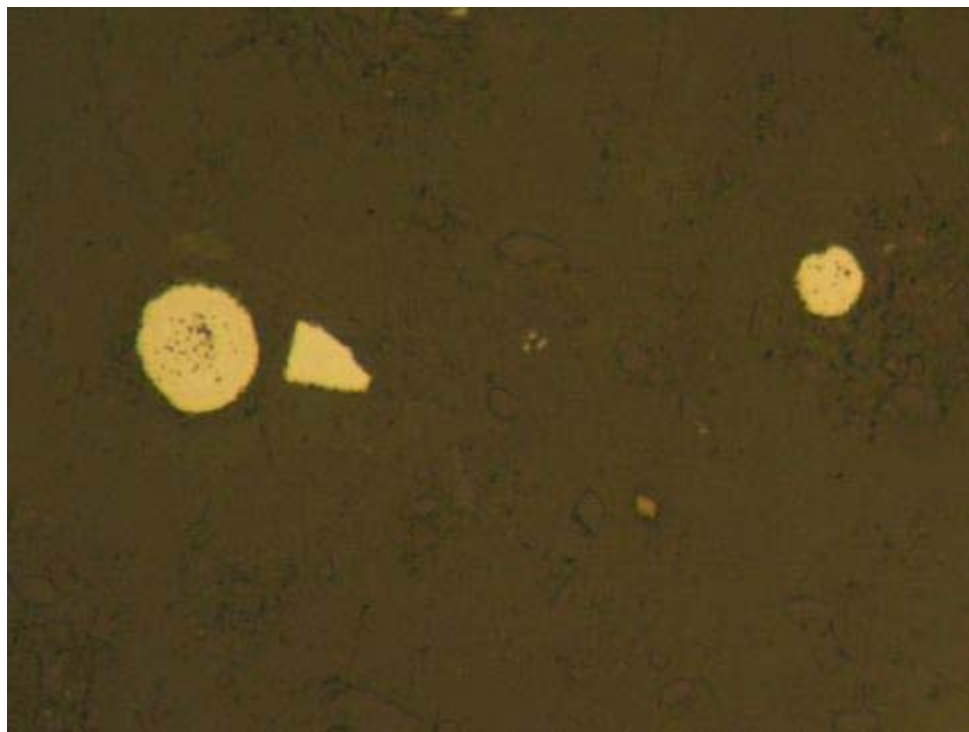


F

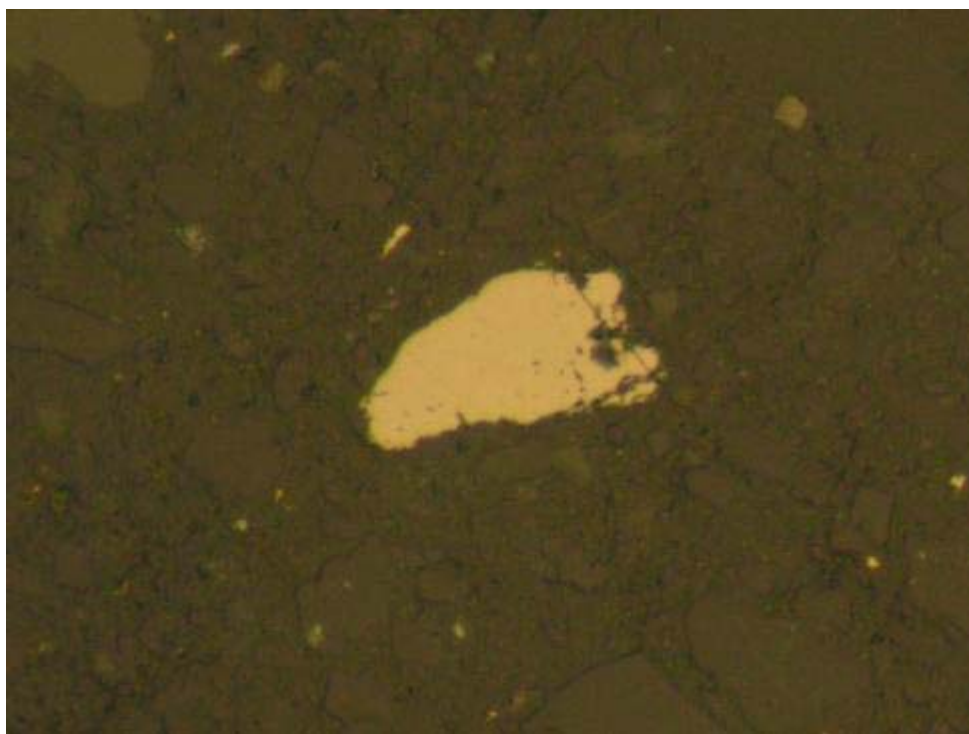
**TP09-13-3:** E) Very fine-grained brown carbonate aggregate and colourless carbonate grains within powder clump. XPL. FOV  $\approx$  0.3 mm. F) Fragment of carbonate aggregate (centre) rimmed and partly replaced by with red-brown Fe-ox. XPL. FOV  $\approx$  0.3 mm.



**TP09-13-3:** G) Orange-brown Fe-ox aggregate as cement to plagioclase grains within fragment in powder clump. XPL. FOV  $\approx$  0.3 mm. H) Pyrite grains and ilmenite grain (top right) within powder clump. Note dark band is part of concentric ring of aphanitic material within powder clump. RL. FOV  $\approx$  0.7 mm.

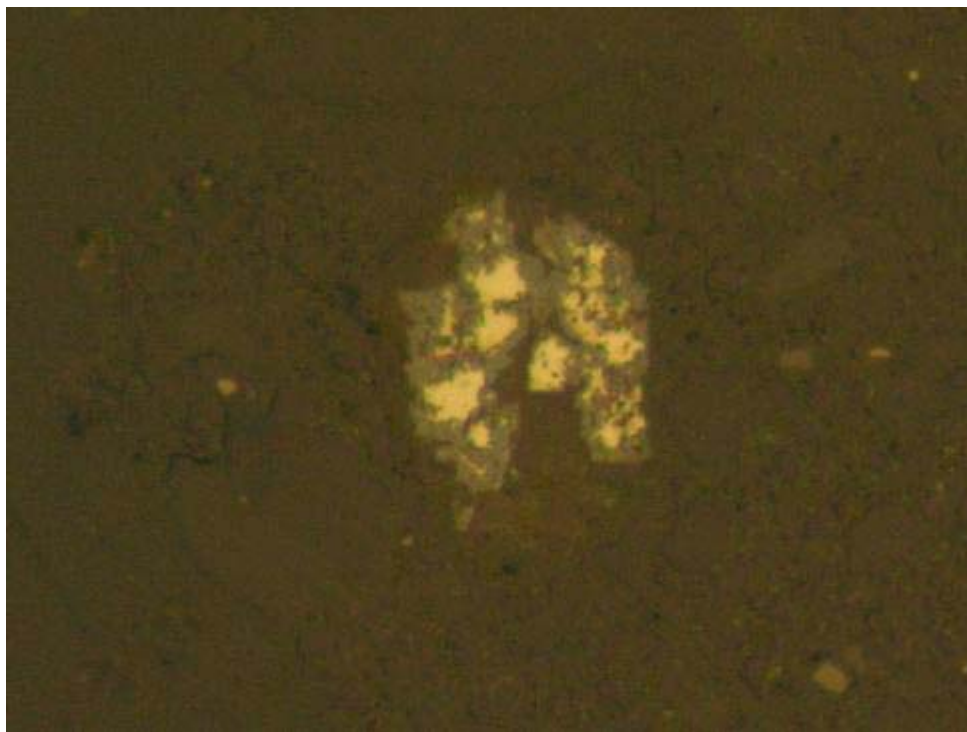


I



J

**TP09-13-3:** I) Grains of framboidal pyrite (far left and right) and anhedral pyrite within powder clump. RL. FOV  $\approx$  0.2 mm. J) Grain of pyrrhotite with irregular grain boundaries without secondary products. RL. FOV  $\approx$  0.2 mm.



K

**TP09-13-3:** K) Rare occurrence of pyrite aggregate rimmed by Fe-ox material. RL. FOV  $\approx$  0.1 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: TP09-14-3

Offcut #: BD-1

**Chip and Offcut Mount Description:**

Fine to coarse angular chips (less than 15 mm size) and very fine grains. Chips include dominantly dark grey banded hornfels with lesser biotite granitoid. Strong reaction of some chips and fine grains to magnet. No reaction to cold, dilute HCl. Reaction of some chips to etching with HF and staining with sodium cobaltinitrite (yellow stain ~5% alkali feldspar).

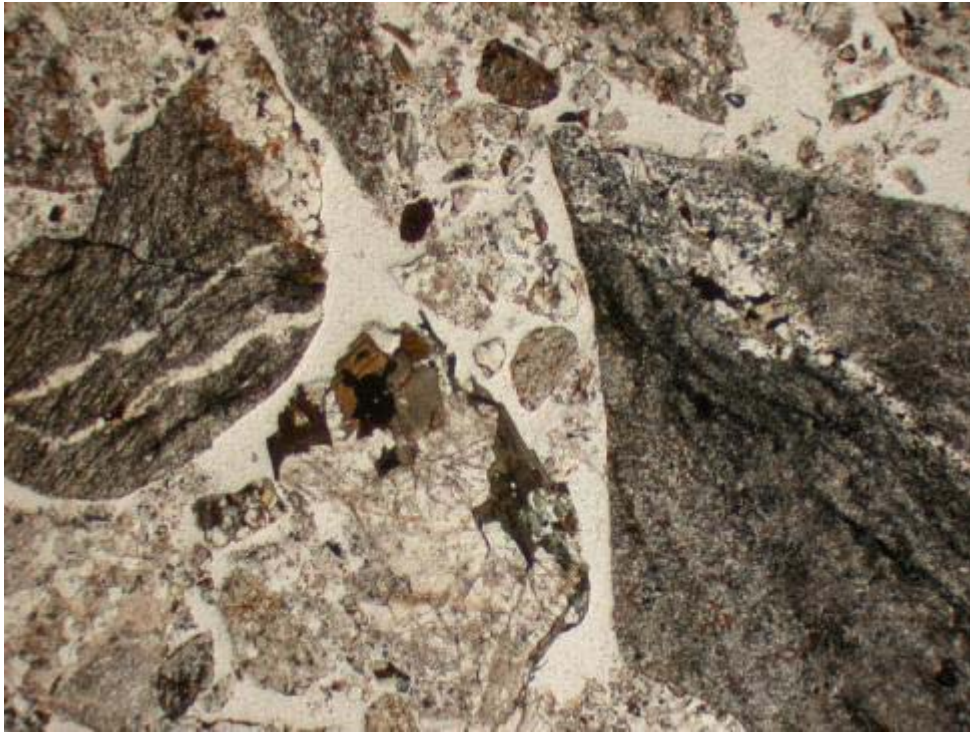
**Polished Thin Section Description:**

Fine to coarse chips representing dominantly very fine-grained variably banded biotite hornfels, chlorite±sericite hornfels, patchy sericite-altered biotite hornfels, minor biotite and hornblende diorite, rare leucocratic granitoid as well as liberated grains of quartz and biotite. The biotite hornfels has a granoblastic to locally weakly foliated texture and comprises very fine-grained quartz, subhedral brown biotite and major feldspar (mostly plagioclase based on absence of stain). In many chips, the biotite and some feldspar are replaced by chlorite±sericite aggregate with abundant aphanitic Ti-oxide aggregate. In some chips, biotite hornfels is selectively replaced by patchy sericite and locally abundant Fe-ox (after former disseminated phases). Fragments of diorite comprise fine-grained plagioclase with lesser quartz and biotite and/or hornblende and minor disseminated magnetite±pyrite. Biotite is variably replaced by chlorite. Hornblende occurs in minor amounts (~1%), in one chip hornblende is pale coloured and stained by red-brown Fe-ox adjacent to magnetite. Biotite occurs in major amounts in the section (~7%). Chlorite comprises approximately 10% of the section. Sericite occurs in major amounts (~3%). Plagioclase in the hornfels and diorite occurs in major amounts (~25%). Rare veinlets of quartz and quartz-K-feldspar are observed within some hornfels chips. Quartz comprises approximately 45% of the section, mostly within hornfels chips. Some hornfels and granitoid fragments have red-brown Fe-ox rinds.

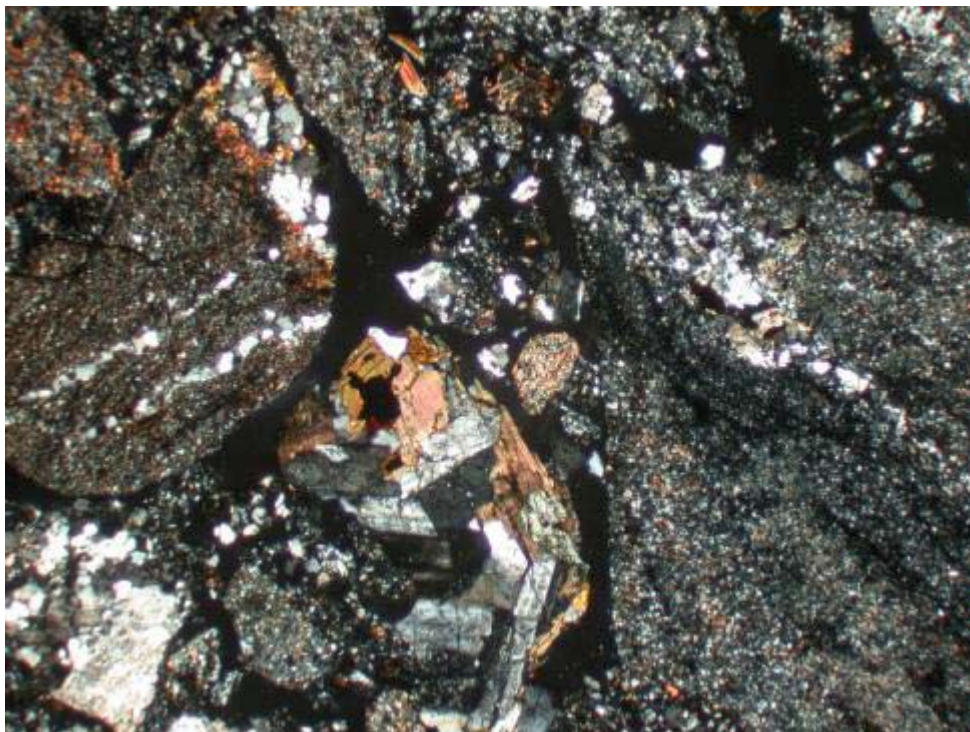
Carbonate occurs rarely in the section as colourless and brown carbonate. Colourless carbonate occurs as liberated carbonate grain fragments and carbonate grains within granitoid fragments. Brown carbonate occurs as very fine-grained anhedral aggregates associated with pyrrhotite as replacement of mafic phases within granitoid fragments. One liberated carbonate grain is partly rimmed red- brown Fe-ox aggregate.

Sulphide occurs in trace amounts as pyrrhotite and pyrite. Pyrrhotite occurs disseminated as anhedral grains (< 0.1 mm) in chlorite±sericite and biotite hornfels chips and less commonly as anhedral aggregates in quartz veins and as liberated anhedral grains. Pyrrhotite grain boundaries vary from straight to irregular. Most pyrrhotite grains are partly replaced by red-brown Fe-ox. Pyrite occurs disseminated as fine eu-anhedral grains (< 0.25 mm) in sericite±carbonate-altered biotite hornfels chips and less commonly as anhedral aggregates in quartz veins and as liberated anhedral grains. Pyrite grain boundaries vary from straight to irregular. Some pyrite grains with hornfels are altered with rims partly replaced by red-brown Fe-ox.

Fe-ox occurs in minor amounts, approximately 3%, as red anhedral and red-brown/orange-brown colloform-textured aggregates. Red Fe-ox occurs as replacement of former disseminated phases in diorite and hornfels. Red-brown Fe-ox occurs as as rims and replacement of pyrrhotite and as fine rinds on fragments. Traces of fine-grained sub-anhedral magnetite occur as liberated grains and disseminated in diorite fragments. Rarely magnetite is partly replaced by hematite.

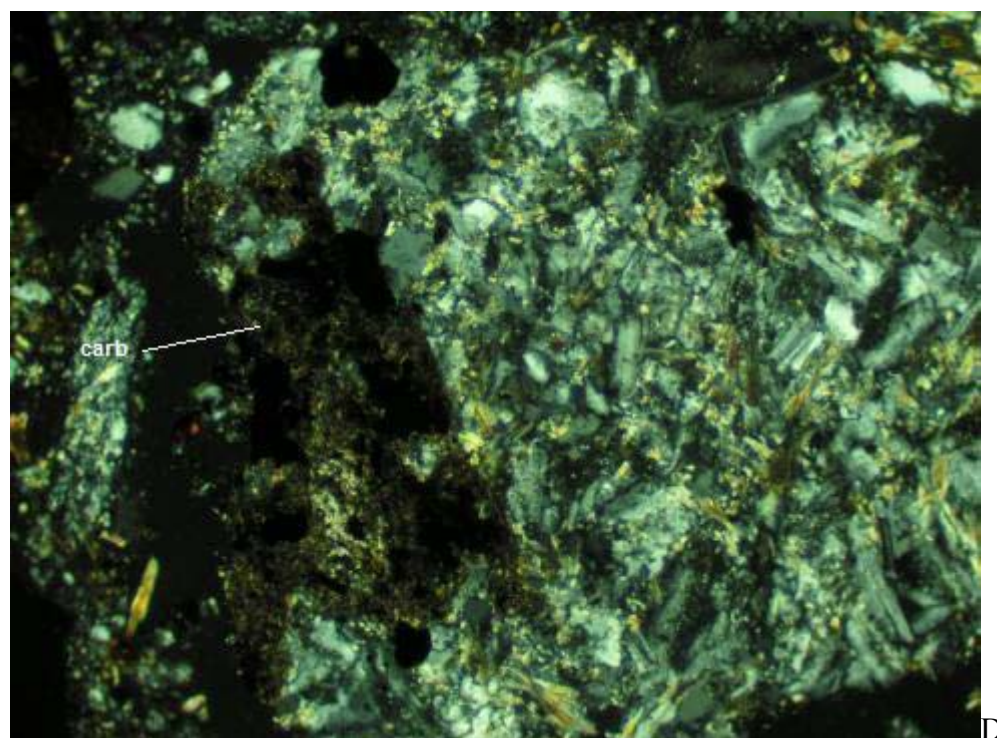
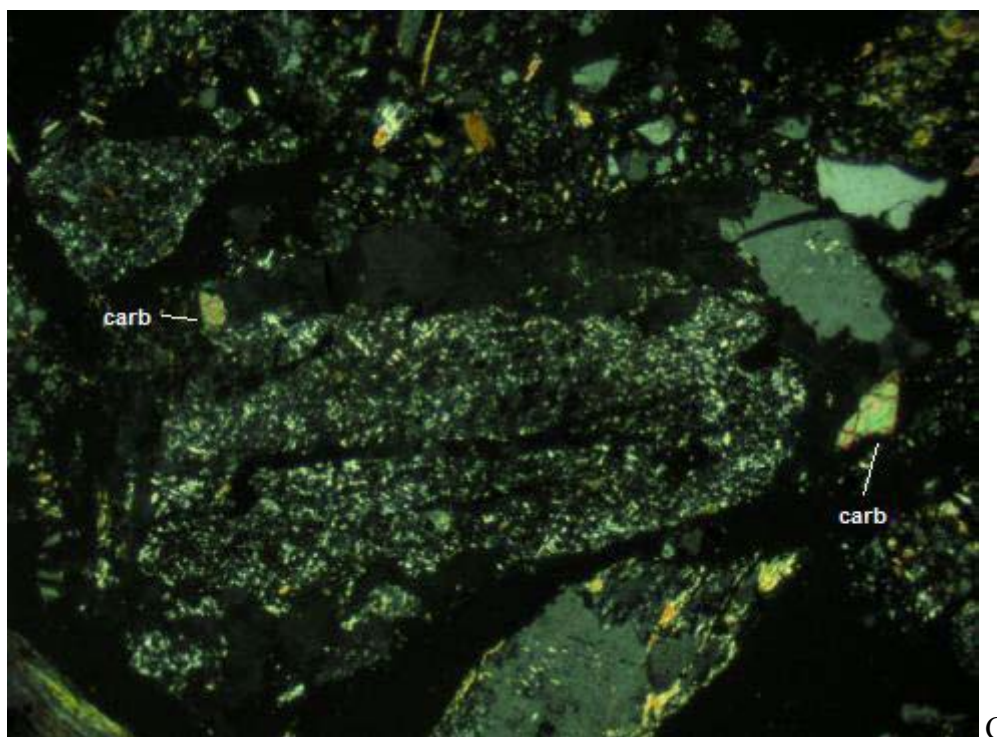


A

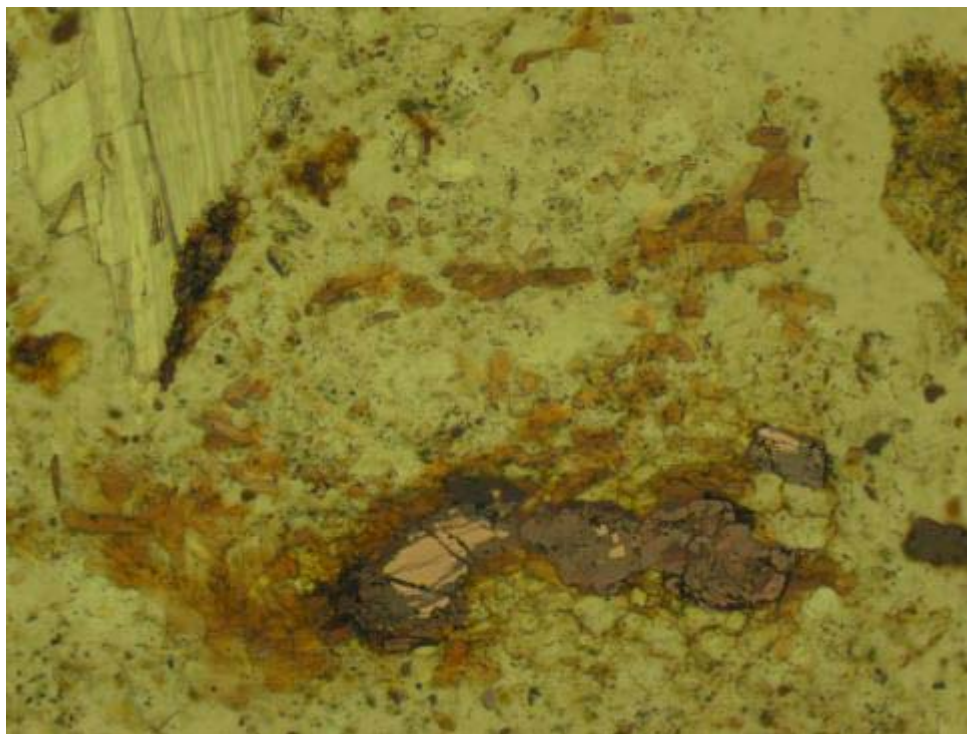


B

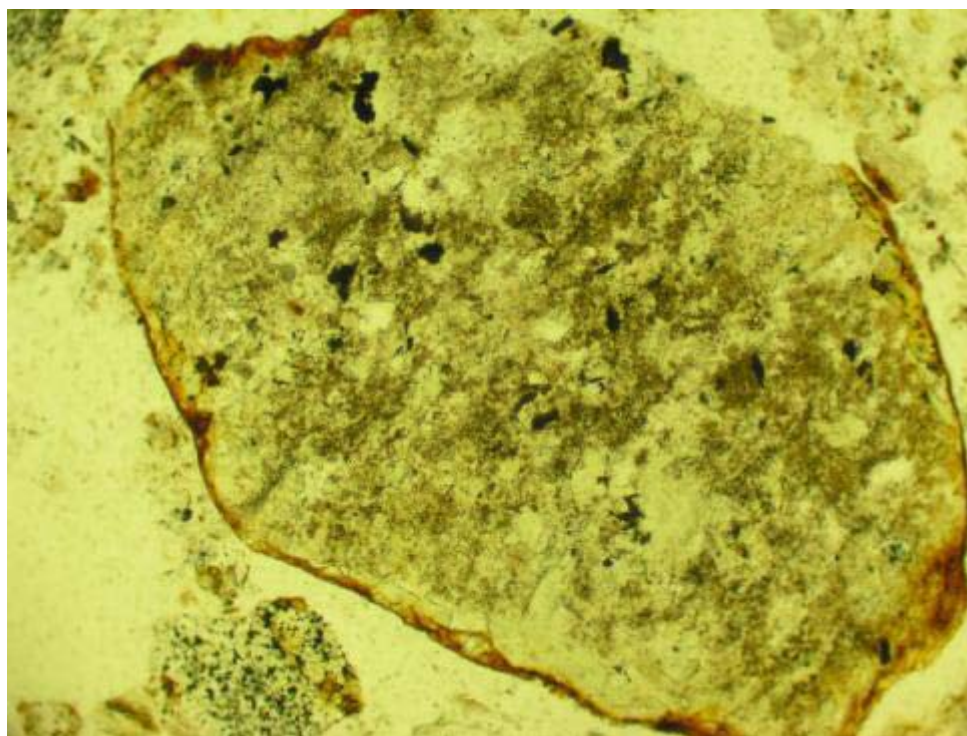
**TP09-14-3:** Representative chips of very fine-grained biotite hornfels with quartz veins and biotite granitoid (diorite). A) PPL, B) XPL, FOV  $\approx$  4.5 mm.



**TP09-14-3:** C) Colourless carbonate grains within granitoid fragment. XPL, FOV  $\approx$  1.5 mm, D) Very fine-grained brown carbonate aggregate with pyrrhotite (opaque) as replacement of former mafic phase in granitoid fragment. XPL, FOV  $\approx$  1.3 mm

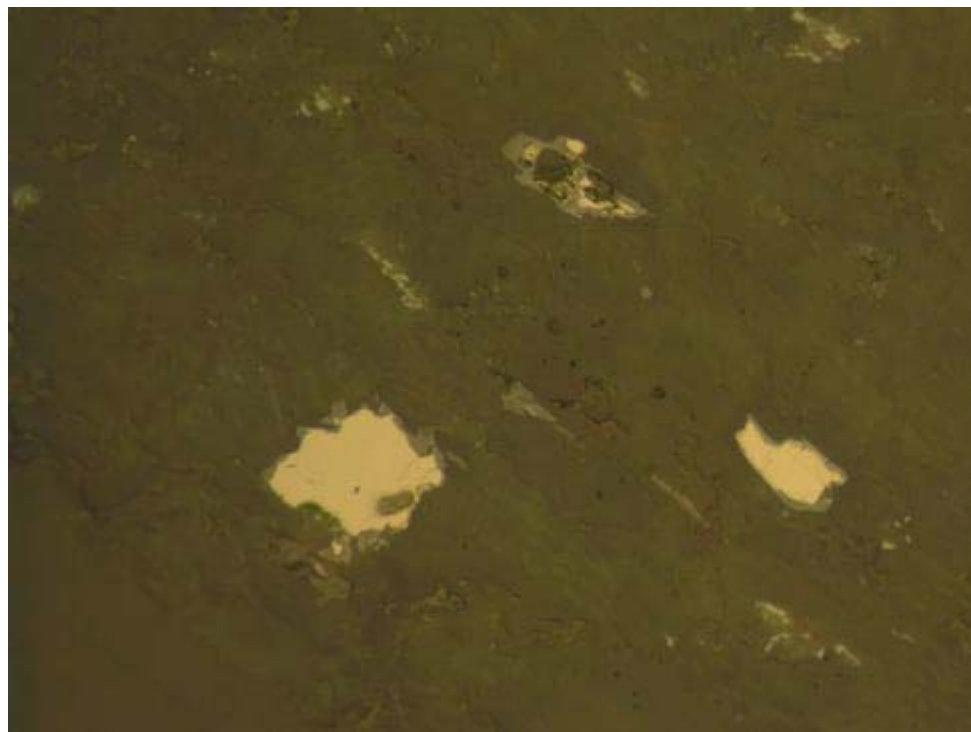


E

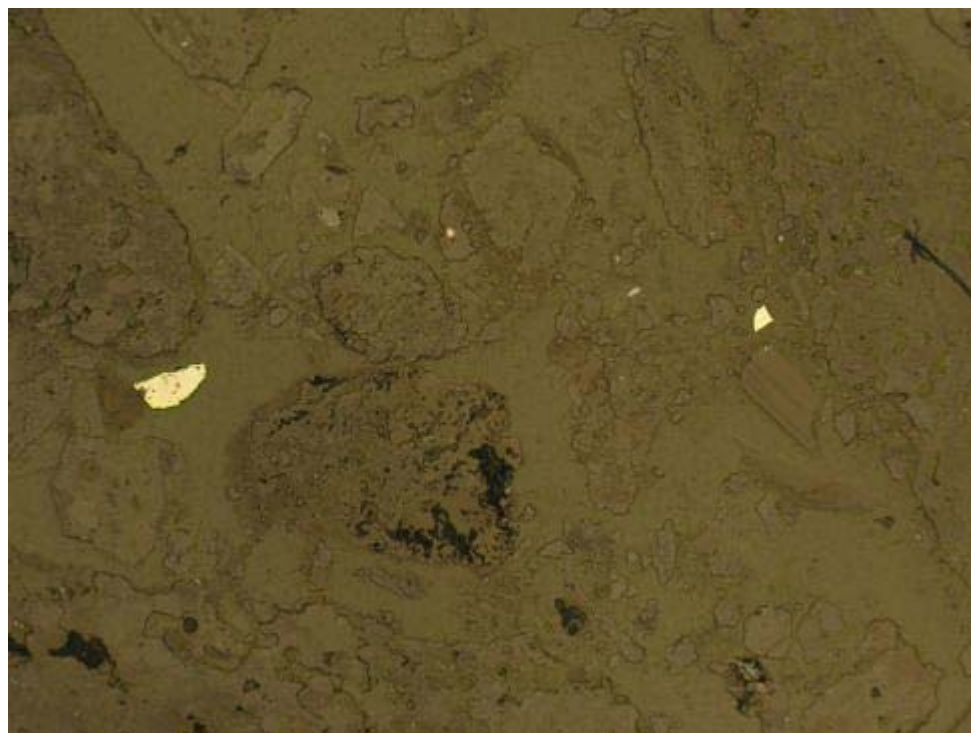


F

**TP09-14-3:** E) Liberated colourless carbonate grain (top left) and pyrrhotite partly replaced by red-brown Fe-ox (below centre) within biotite hornfels fragment. PPL+RL. FOV  $\approx$  0.7 mm. F) Fragment of chlorite-altered hornfels with red-brown Fe-ox rind. PPL. FOV  $\approx$  1.3 mm.



G



H

**TP09-14-3:** G) Disseminated pyrrhotite in biotite hornfels. Note pyrrhotite rims partly replaced by Fe-ox. RL. FOV  $\approx$  0.3 mm. H) Liberated pyrite grains without alteration rims. RL. FOV  $\approx$  1.3 mm.



I

**TP09-14-3:** I) Disseminated pyrite partly replaced by Fe-ox material. RL. FOV  $\approx$  0.2 mm.

SGS-CEMI Project #: 0935Avanti Mining

Sample ID: Avanti Master

Offcut #: CA-1B

**Chip and Offcut Mount Description:**

Fine to medium angular chips and grains (less than 2 mm size). Chips and grains vary from olive-grey, dark greenish-grey, white and light grey with some grains of quartz aggregate and traces of pyrite and molybdenite. Strong reaction of some grains to cold, dilute HCl. Reaction of a few grains to magnet. Reaction of many grains to etching with HF and staining with sodium cobaltinitrite (yellow stain ~30% alkali feldspar).

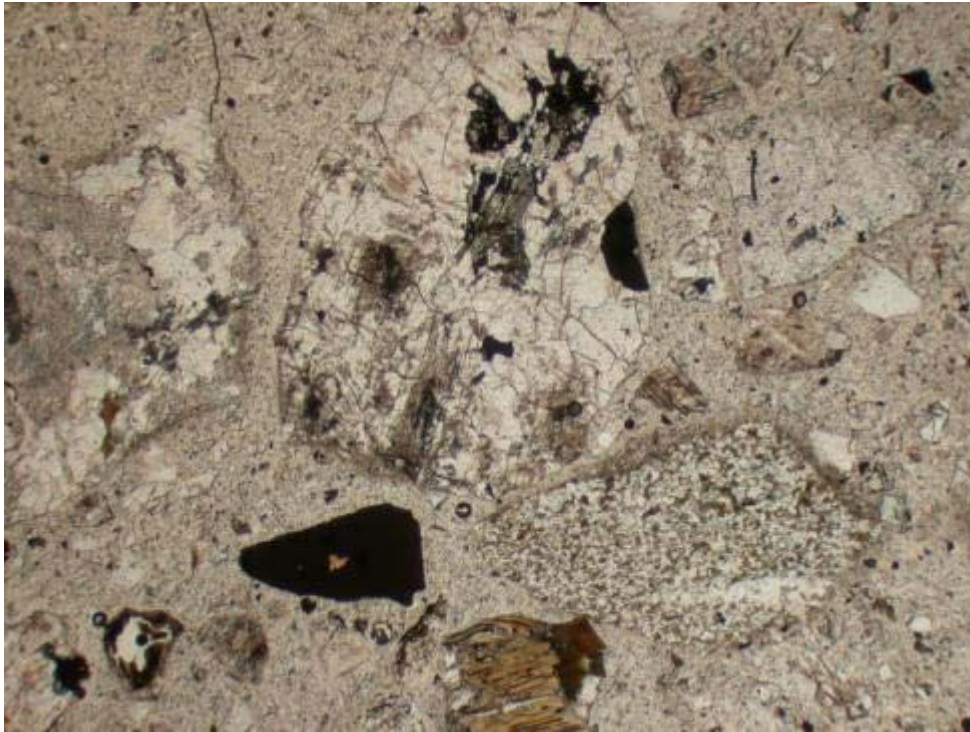
**Polished Thin Section Description:**

Fine to medium chips representing fine-grained biotite granitoid, sericite-altered granitoid, quartz-K-feldspar-carbonate veins, quartz veins, carbonate veins, biotite hornfels, sericite-altered hornfels, rare lamprophyre, rare basalt, rare quartz-garnet-carbonate aggregate and abundant liberated grains including K-feldspar, quartz, biotite and pyrite. The granitoid fragments comprise fine-grained K-feldspar, quartz, variably sericite-altered plagioclase, locally biotite and traces of amphibole, titanite, apatite, Ti-oxide and rare zircon. Biotite is locally partly replaced by traces of chlorite and carbonate. Rare epidote and clay occur as alteration of granitoid fragments. The biotite hornfels has a granoblastic to locally weakly foliated texture and comprises very fine-grained quartz, subhedral brown biotite and major feldspar. In some chips, the biotite and some feldspar are replaced by sericite±carbonate aggregate with traces of Ti-oxide aggregate. Biotite comprises approximately 3% of the section. Sericite comprises approximately 7% of the section. Quartz comprises approximately 40% of the section. Plagioclase comprises approximately 10% of the section.

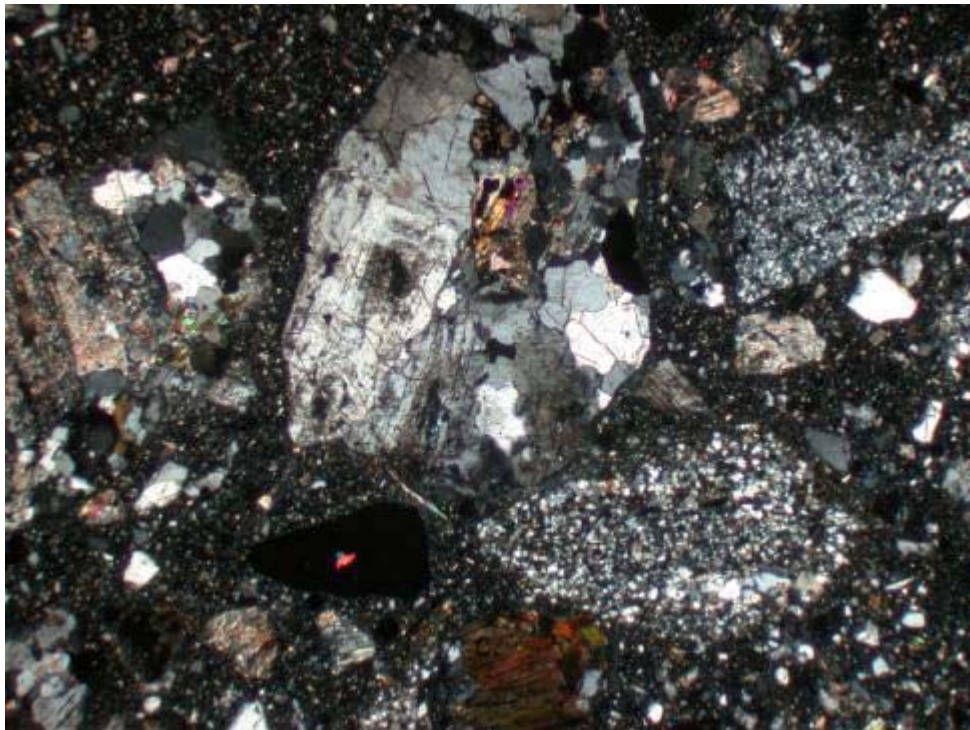
Carbonate occurs in major amounts (~5%) as colourless carbonate and brown carbonate. Colourless carbonate occurs as fine-grained (< 0.8 mm) anhedral liberated grains, as liberated anhedral aggregates, as irregular patches replacing plagioclase and biotite in rock fragments, as fracture infill and in as veinlets. Brown carbonate occurs in lesser amounts as patchy very fine-grained aggregates replacing colourless carbonate, as patches within quartz-garnet aggregate and as patches in sericite-altered hornfels. Some of the carbonate in fragments must be calcite based on reaction to HCl. A few carbonate grains and aggregates are rimmed and/or partly replaced by red- brown Fe-ox.

Sulphide occurs in minor amounts (~4%) as pyrite with traces of pyrrhotite and molybdenite and rare sphalerite, galena and chalcopyrite. Pyrite, approximately 4%, occurs as liberated anhedral grains (< 0.8 mm), as eu-anhedral grains disseminated in sericite±carbonate and biotite hornfels and granitoid chips and as patchy aggregates in quartz veins. Pyrite grain boundaries are irregular to straight. Pyrite rims are unaltered. Fine-grained anhedral pyrrhotite (< 0.3 mm) occurs as liberated grains, in carbonate veinlets and disseminated in biotite hornfels fragments. Pyrrhotite grains are unaltered. Fine-grained molybdenite (< 0.3 mm) occurs as platy aggregates, locally with pyrite, in quartz vein fragments. Rare fine-grained sphalerite and galena (< 0.3 mm) occurs as liberated grains. Rare very fine-grained chalcopyrite occurs as grains within granitoid chips.

Aphanitic red-brown Fe-ox material occurs rarely as replacement of carbonate aggregate. Rare grains of fine-grained magnetite (~0.1 mm) occur as liberated grains.

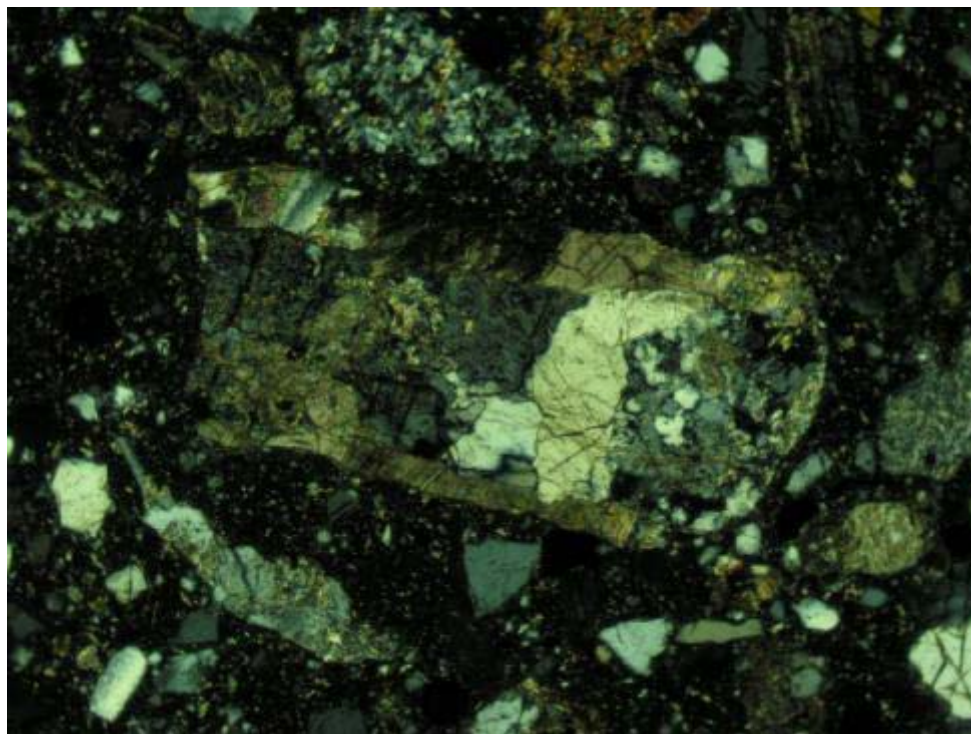


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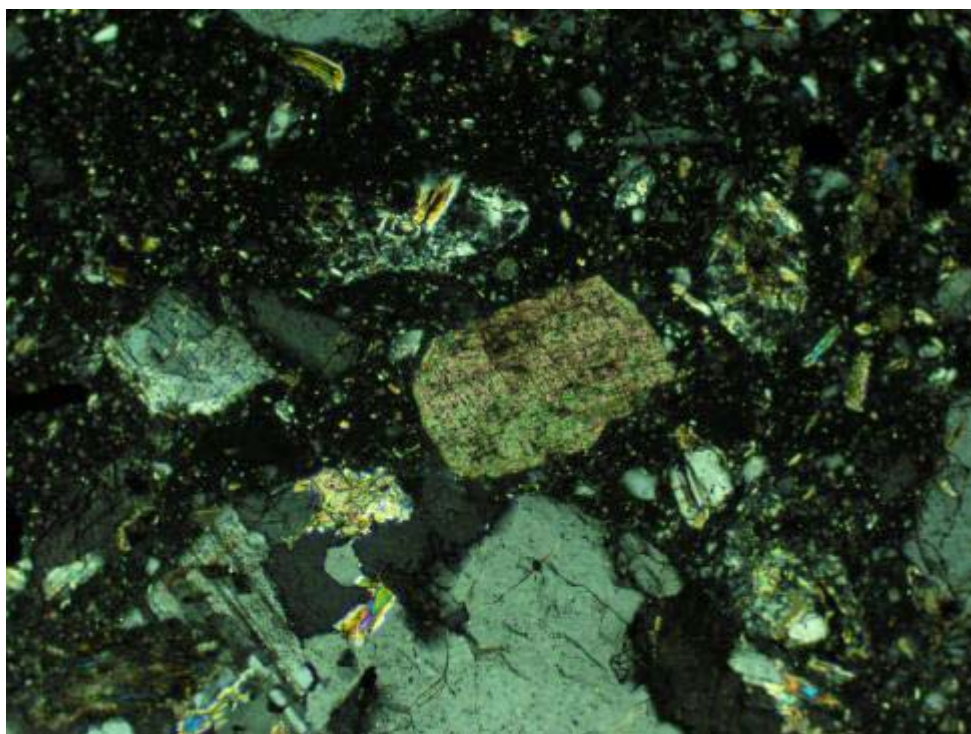


B

**Avanti Master:** Representative view of granitoid and hornfels chips and liberated grains of pyrite (opaque), quartz and biotite. A) PPL, B) XPL, FOV  $\approx$  4.5 mm.

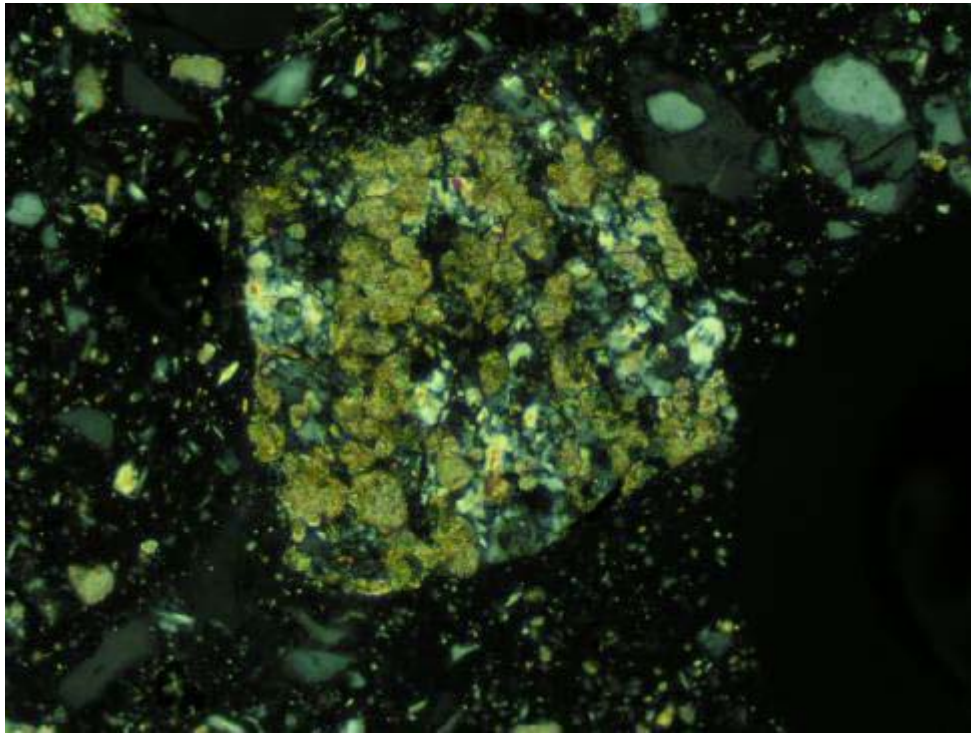


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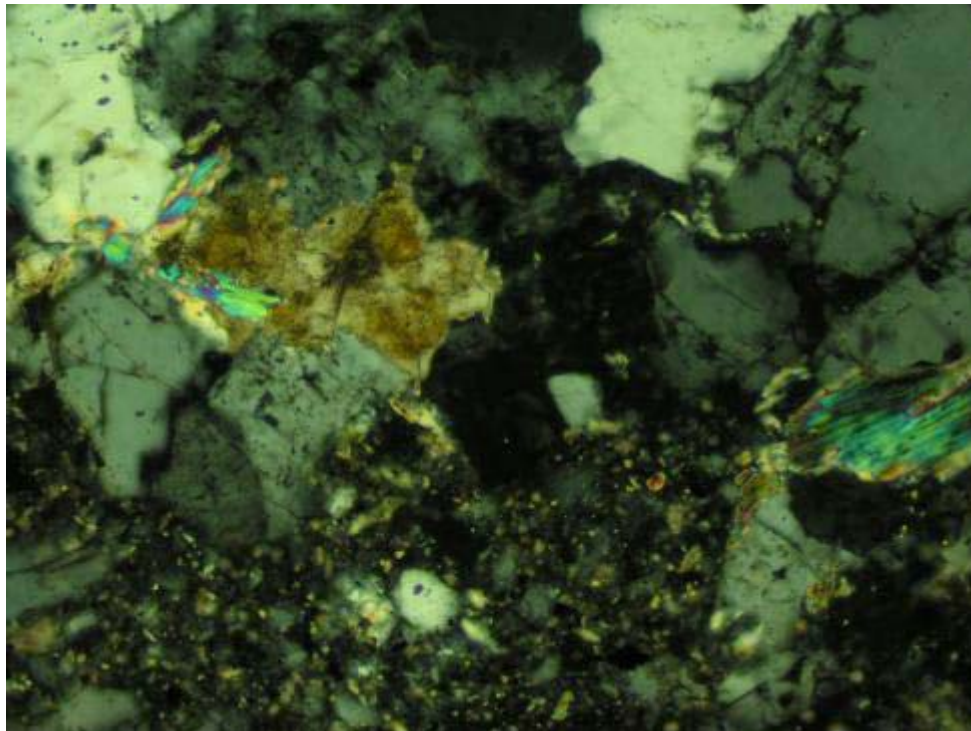


D

**Avanti Master:** C) Quartz-K-feldspar vein with colourless carbonate vein margins and patchy replacement of K-feldspar. XPL, FOV  $\approx$  2.6 mm, D) Liberated colourless carbonate grain (centre). XPL, FOV  $\approx$  1.3 mm

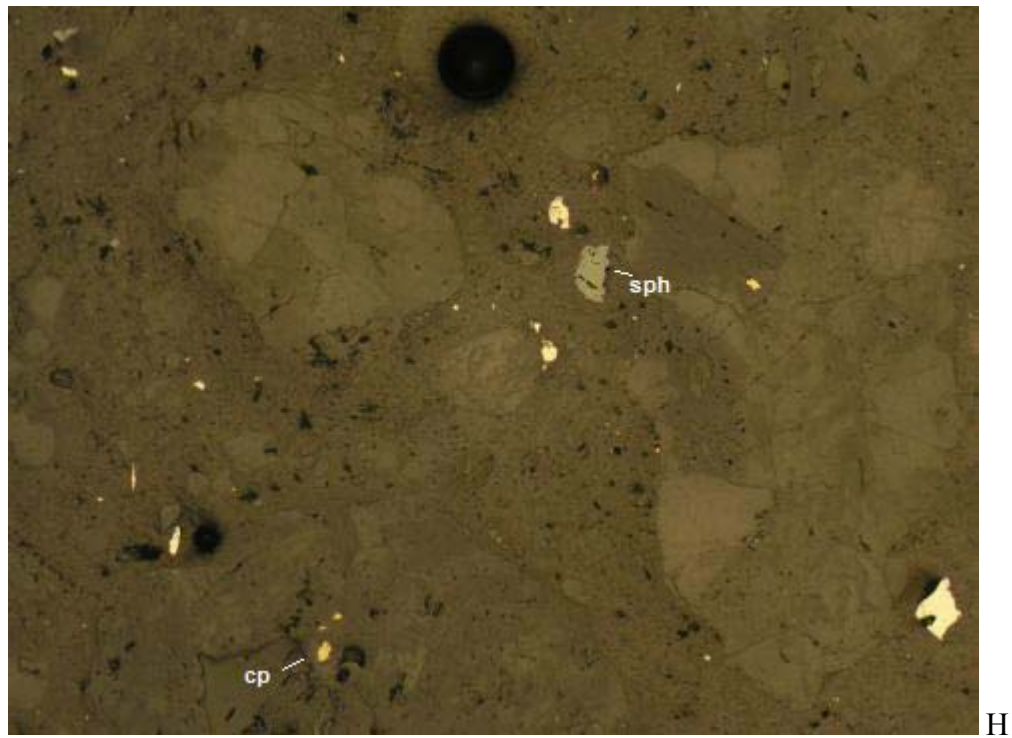
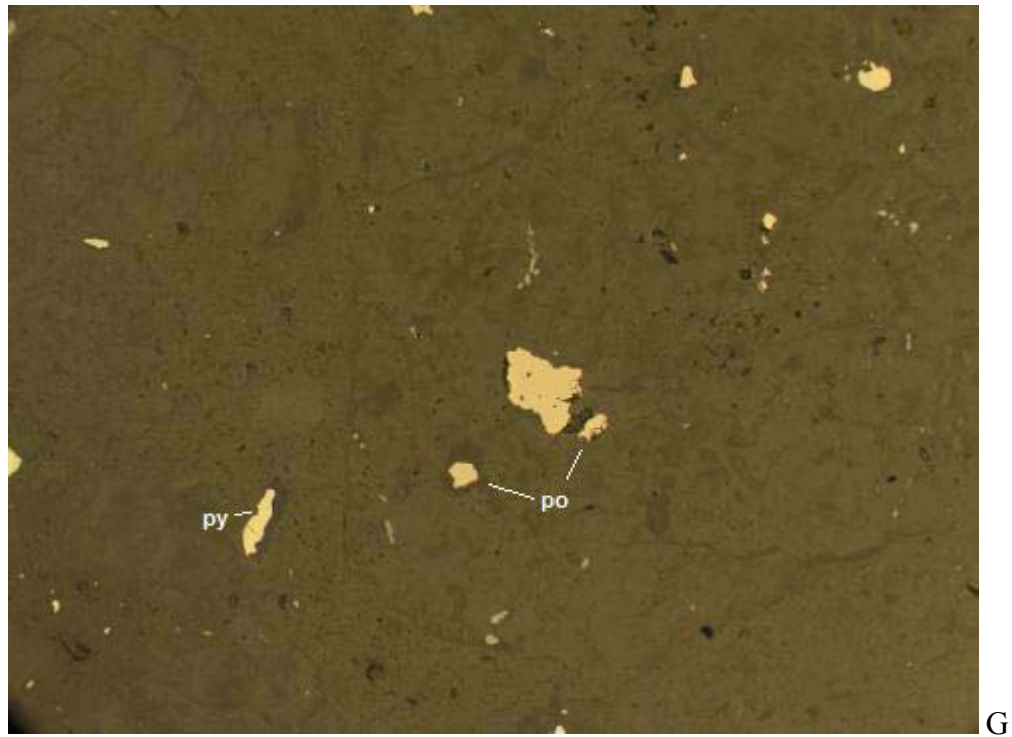


E

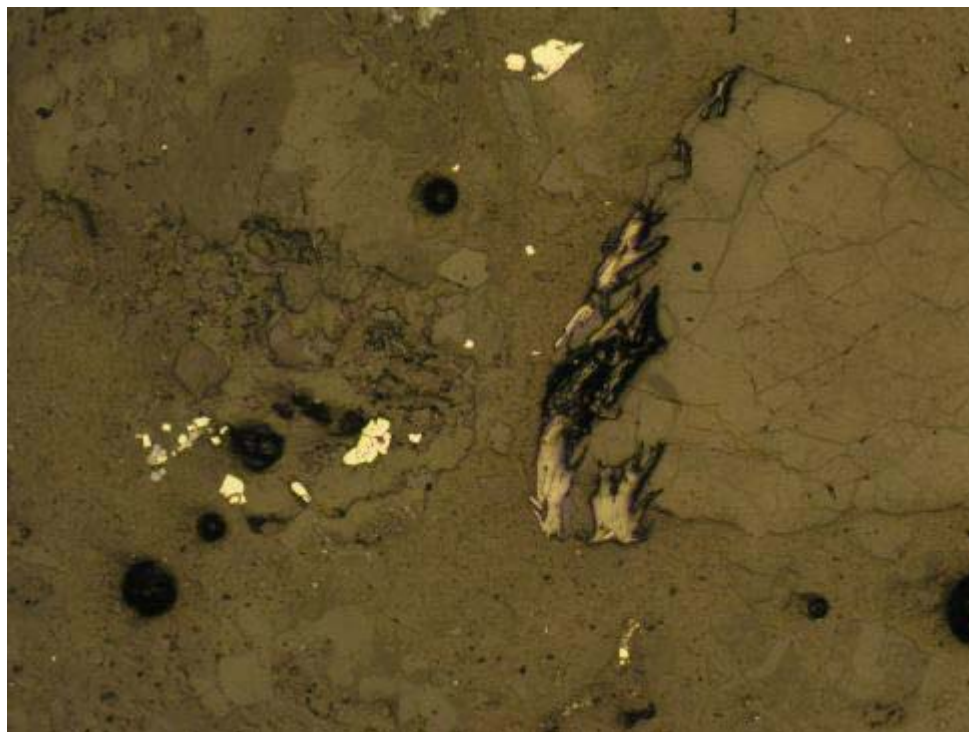


F

**Avanti Master:** E) Patchy brown carbonate aggregate within fragment of sericite-altered hornfels. XPL. FOV  $\approx$  0.3 mm. F) Carbonate aggregate partly replaced by very fine-grained red-brown Fe-ox within granitoid fragment. XPL. FOV  $\approx$  0.7 mm.



**Avanti Master:** G) Liberated pyrite (left) and disseminated pyrrhotite in biotite hornfels (right). RL. FOV ≈ 1.3 mm. H) Liberated pyrite and sphalerite (sph) grains; chalcopyrite (cp) within biotite granitoid fragment. RL. FOV ≈ 2.6 mm.



I

**Avanti Master:** I) Platy molybdenite aggregate within quartz vein fragment (right). Disseminated pyrite within sericite-carbonate altered granitoid (left). RL. FOV  $\approx$  2.6 mm.

**SGS-CEMI Project #:** 0935Avanti Mining

**Sample ID:** Avanti Whole Master

Offcut #: CA-2B

**Chip and Offcut Mount Description:**

Fine grains (less than 1 mm size) and clumps of very light grey powder (less than 3 mm size). Strong reaction to cold, dilute HCl. No reaction to magnet. Reaction of many grains and powder clumps to etching with HF and staining with sodium cobaltinitrite (yellow stain ~30% alkali feldspar).

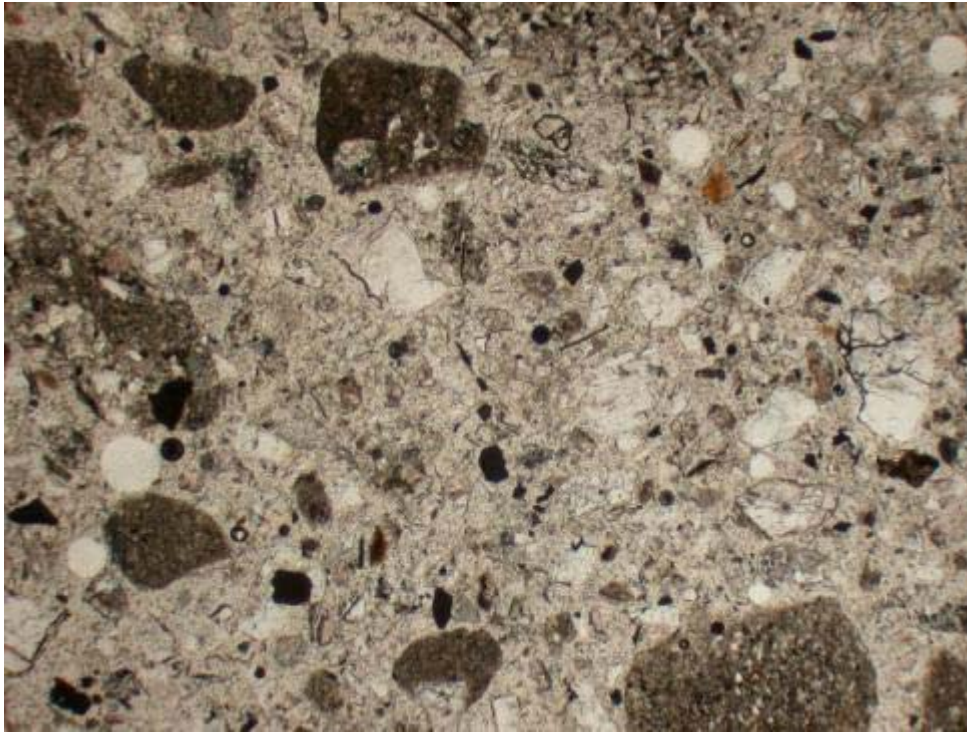
**Polished Thin Section Description:**

Fine chips (< 0.8 mm) representing very fine-grained biotite hornfels and sericite-altered hornfels, fine-grained granitoid, fine-grained quartz aggregate, abundant liberated fine grains (< 0.8 mm) including K-feldspar, quartz, biotite, carbonate and pyrite, numerous clumps (0.2 to 5 mm size) of fine to very fine-grains and powder and rare lamprophyre and basalt. The biotite hornfels has a granoblastic to locally weakly foliated texture and comprises very fine-grained quartz, subhedral brown biotite and major feldspar. In some chips, the biotite and some feldspar are replaced by sericite±carbonate aggregate with traces of Ti-oxide aggregate. The granitoid fragments are generally comprise fine-grained K-feldspar, quartz, variably sericite-altered plagioclase and locally biotite. Traces of amphibole occur as liberated grains. Biotite is locally partly replaced by traces of chlorite. Traces of clay occur as alteration of K-feldspar. Biotite comprises approximately 3% of the section. Sericite comprises approximately 5% of the section. Quartz comprises approximately 40% of the section. Plagioclase comprises approximately 10% of the section. Clumps of fine to very fine-grains and powder comprise approximately 20% of the section. The clumps comprise fine to very fine grains of quartz, feldspars, carbonate, pyrite, pyrrhotite, chalcopyrite, Ti-oxide, Fe-ox and abundant very fine-grained biotite, sericite and unidentified material. The unidentified material/clay (< 0.005 mm) comprises approximately ~3% of the section.

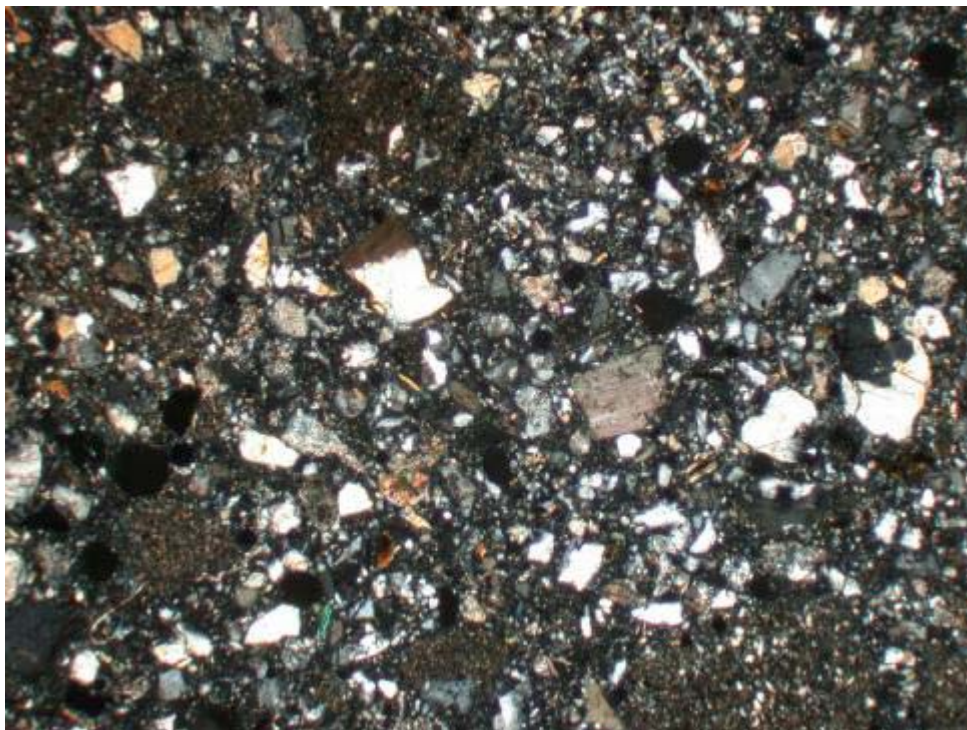
Carbonate occurs in major amounts (~5%) as colourless carbonate and lesser brown carbonate. Colourless carbonate occurs as fine-grained (< 0.3 mm) anhedral liberated grains, as liberated anhedral aggregates, as grains and aggregates within clumps of powder and fine grains and as irregular patches replacing plagioclase and biotite in rock fragments. Brown carbonate occurs in lesser amounts as liberated aggregates, as patches replacing lamprophyre fragments, as grains and aggregates within clumps of powder and as patches with sericite-alteration. Some of the carbonate in fragments must be calcite based on reaction to HCl. A few carbonate grains and aggregates are rimmed and/or partly replaced by red- brown Fe-ox.

Sulphide occurs in minor amounts (~3%) as pyrite with rare pyrrhotite, chalcopyrite, galena, marcasite and molybdenite. Pyrite, approximately 3%, occurs as liberated anhedral grains (< 0.45 mm) and as eu-anhedral grains disseminated in hornfels and granitoid chips. Liberated pyrite grains are commonly fractured; grain boundaries are irregular to straight. Pyrite rims are unaltered. Fine-grained anhedral pyrrhotite (< 0.15 mm) occurs as liberated grains. Pyrrhotite grains are rarely rimmed by very fine-grained marcasite aggregate. Rare fine-grained molybdenite (< 0.2 mm) occurs as liberated plates. Rare fine-grained galena (< 0.08 mm) occurs as liberated grains. Rare fine-grained chalcopyrite (0.1 mm) occurs within a granitoid fragment and as grains within clumps of powder. Rare marcasite occurs as a very fine-grained liberated aggregate.

Aphanitic red-brown Fe-ox material occurs rarely as replacement of carbonate aggregate and as very fine grains scattered within powder clumps. Rare grains of very fine-grained magnetite (~0.05 mm) occur as grains within granitoid chips and powder clumps. Magnetite is locally partly replaced by hematite. Locally, granitoid chips are stained red-brown adjacent to disseminated magnetite.

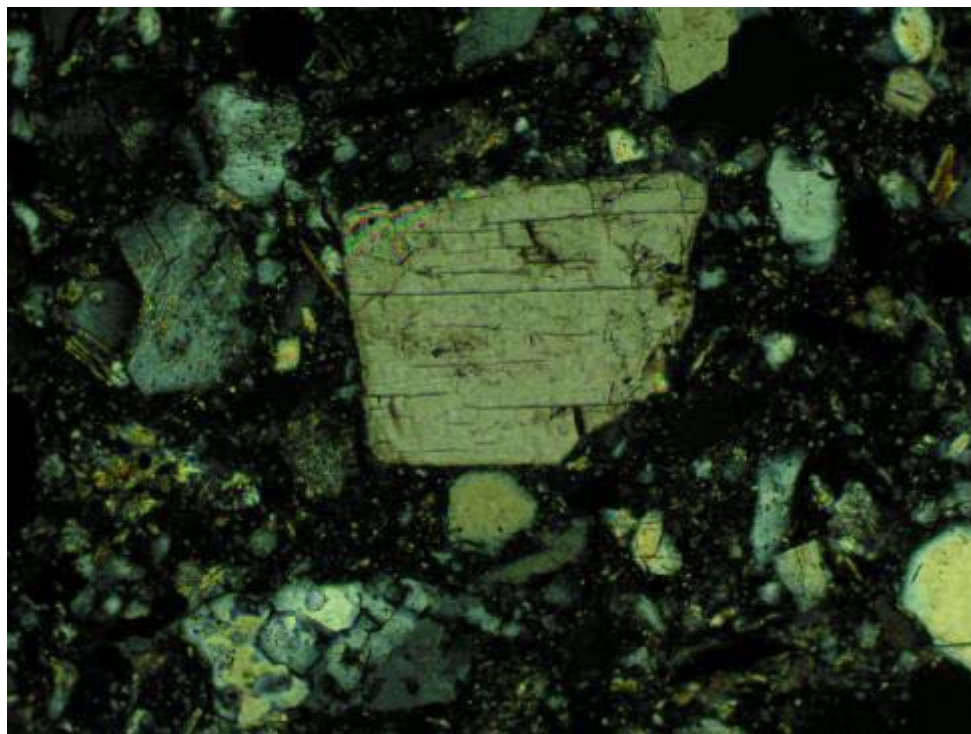


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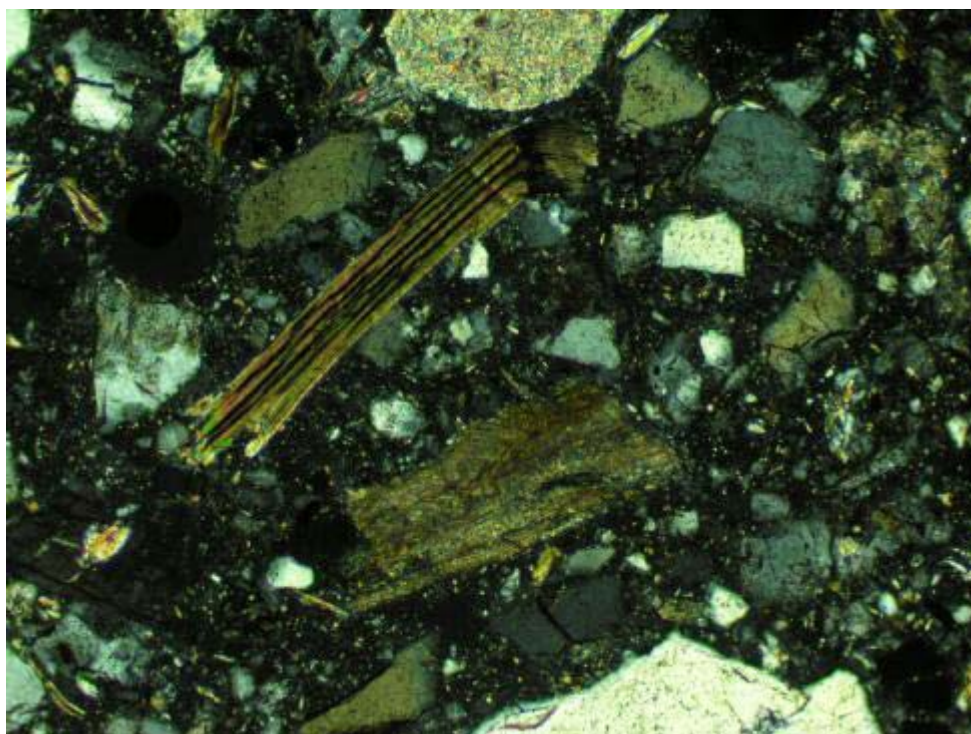


B

**Avanti Whole Master:** Representative view of liberated fine grains of quartz, K-feldspar, biotite, rock chips and clumps of fine grains and powder. A) PPL, B) XPL, FOV  $\approx$  4.5 mm.

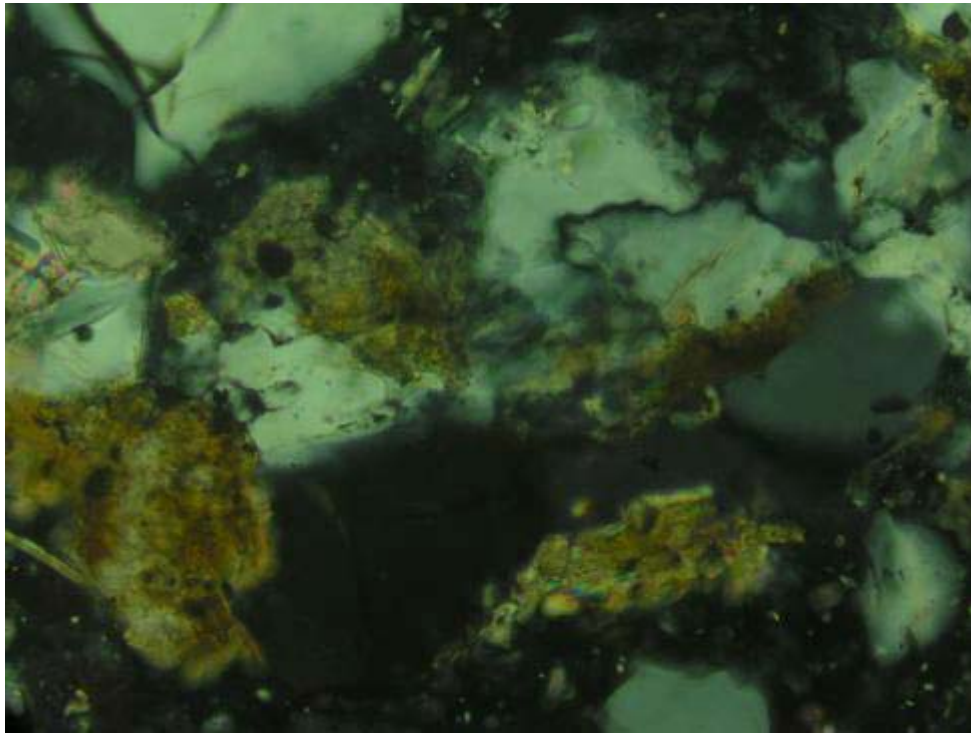


C

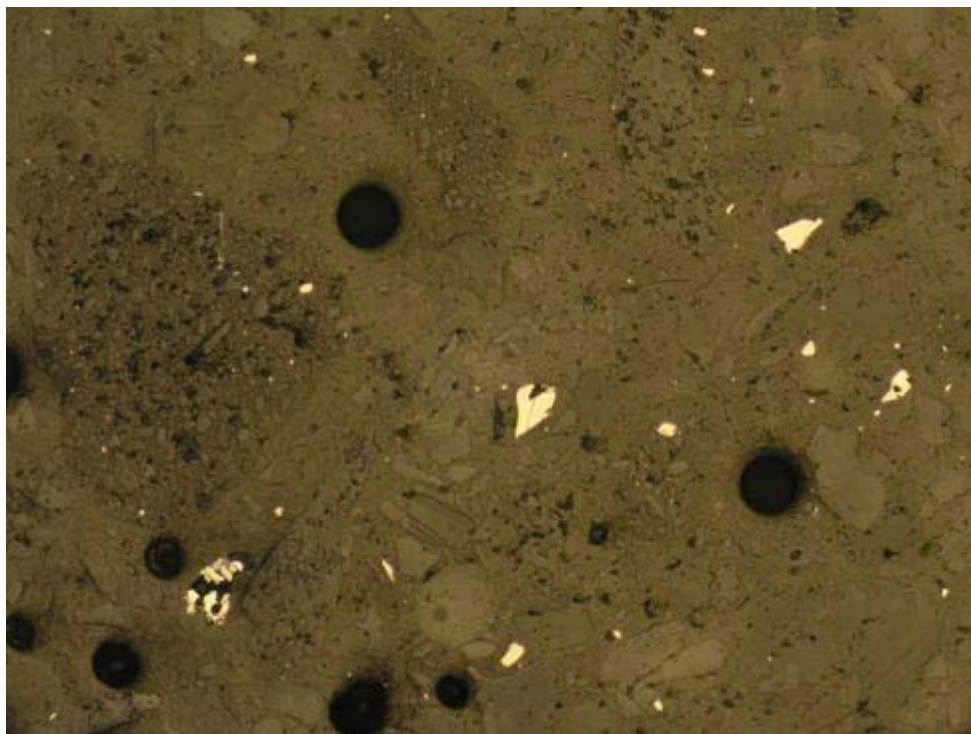


D

**Avanti Whole Master:** C) Liberated colourless carbonate grain (centre). XPL, FOV  $\approx$  1.3 mm, D) Liberated brown carbonate aggregate (below centre) and biotite plate (left). XPL, FOV  $\approx$  1.3 mm

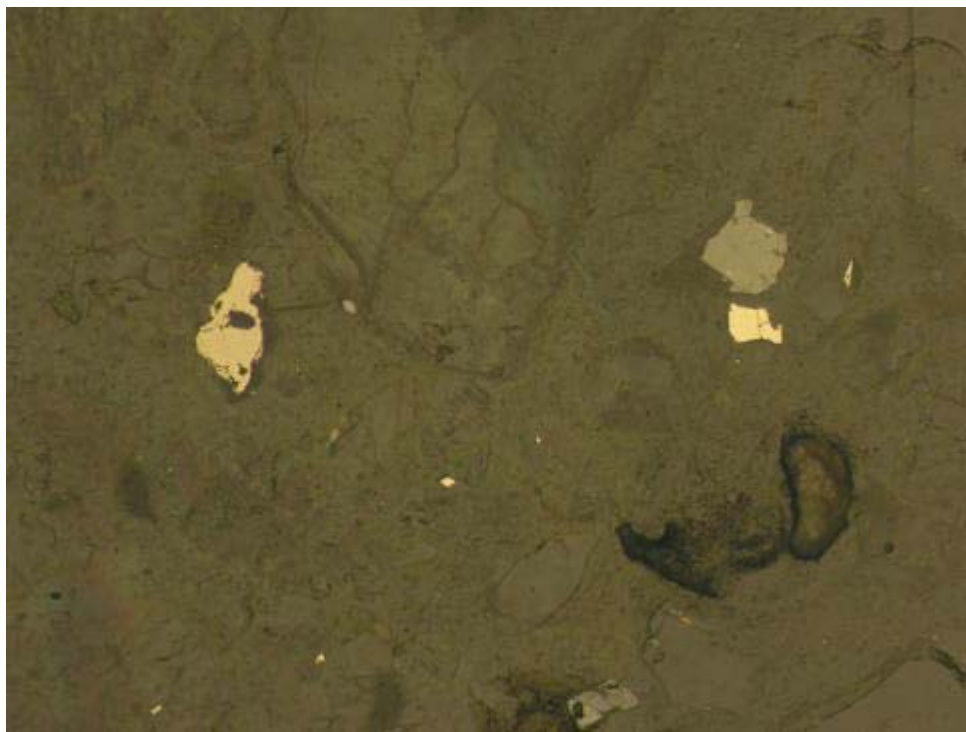


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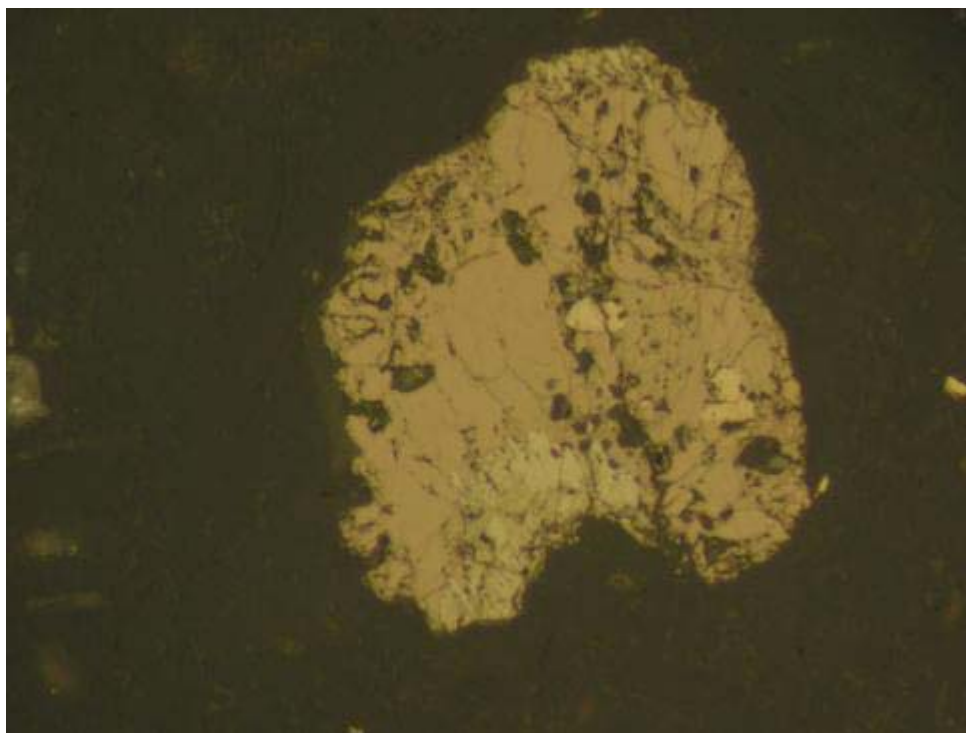


F

**Avanti Whole Master:** E) Patchy carbonate aggregate partly replaced by red-brown Fe-ox aggregate. XPL. FOV  $\approx$  0.2 mm. F) Overview of pyrite distribution as liberated grains and within powder clumps. RL. FOV  $\approx$  2.6 mm.

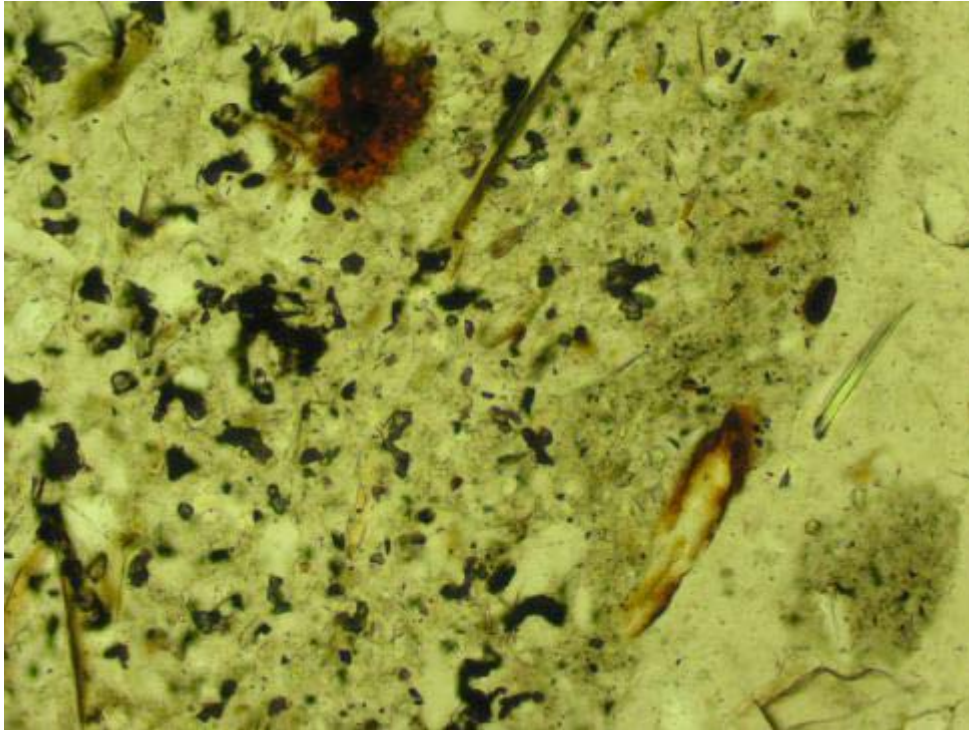


G



H

**Avanti Whole Master:** G) Liberated pyrrhotite (left) and disseminated Ti-oxide and pyrite grains (right). RL. FOV  $\approx$  0.7 mm. H) Rare pyrrhotite grain partly replaced by very fine-grained marcasite aggregate. RL. FOV  $\approx$  0.3 mm.



**Avanti Whole Master:** I) Fe-ox aggregate (top, left) within clump of fine grains and powder. Note Fe-ox as rind to very fine-grained chip (lower right). PPL. FOV  $\approx$  0.7 mm.

**SGS-CEMI Project #:** 0935Avanti Mining

**Sample ID:** Avanti Whole Master (+100)

Offcut #: CA-3A

**Chip and Offcut Mount Description:**

Fine grains (less than 1 mm size) and clumps of very light grey powder (less than 5 mm size). Strong reaction to cold, dilute HCl. Reaction of a few grains to magnet. Reaction of many grains and powder clumps to etching with HF and staining with sodium cobaltinitrite (yellow stain ~30% alkali feldspar).

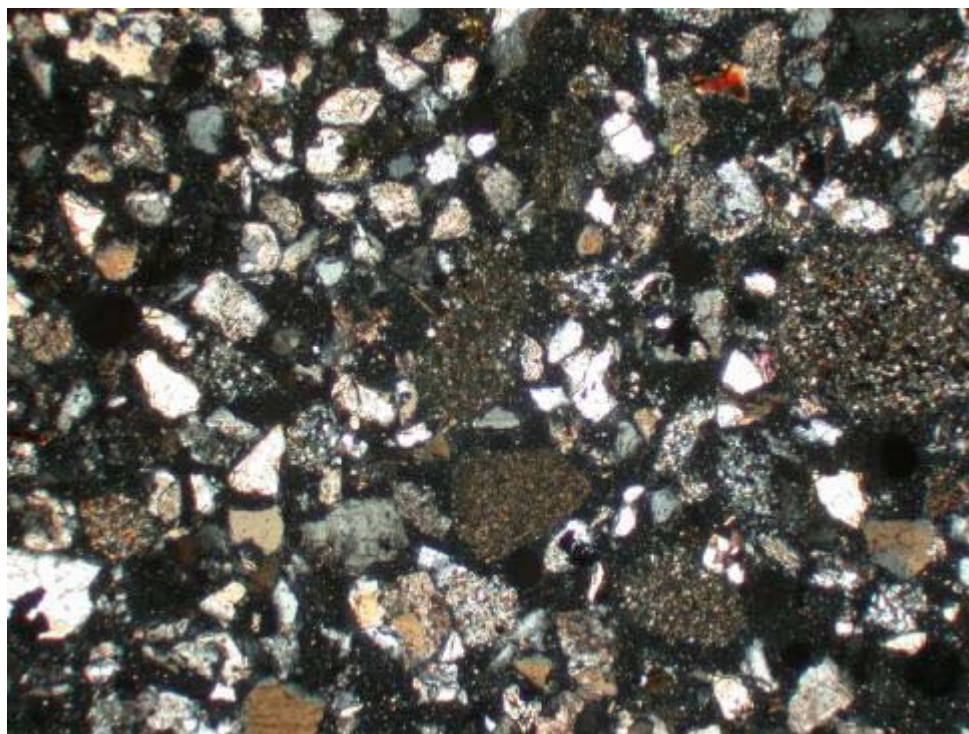
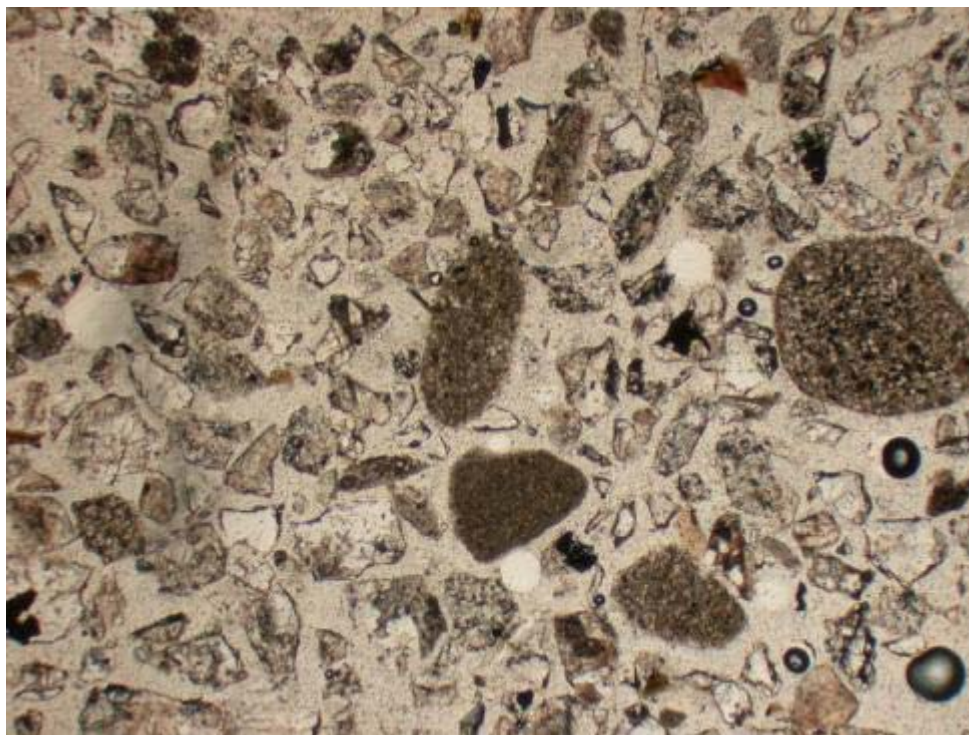
**Polished Thin Section Description:**

Fine chips (< 0.7 mm) representing very fine-grained biotite hornfels and sericite-altered hornfels, fine-grained granitoid, fine-grained quartz aggregate, abundant liberated fine grains (< 0.7 mm) including K-feldspar, quartz, biotite, carbonate and pyrite, numerous clumps (0.2 to 2 mm size) of fine to very fine-grains and powder and rare lamprophyre and basalt. The biotite hornfels has a granoblastic to locally weakly foliated texture and comprises very fine-grained quartz, subhedral brown biotite and major feldspar. In some chips, the biotite and some feldspar are replaced by sericite±carbonate aggregate with traces of Ti-oxide aggregate. The granitoid fragments are generally comprise fine-grained K-feldspar, quartz, variably sericite-altered plagioclase and locally biotite and traces of titanite and apatite. Traces of amphibole occur as liberated grains. Biotite is locally partly replaced by traces of chlorite. Traces of clay occur as alteration of K-feldspar. Biotite comprises approximately 3% of the section. Sericite comprises approximately 6% of the section. Quartz comprises approximately 40% of the section. Plagioclase comprises approximately 10% of the section. Clumps of fine to very fine-grains and powder comprise approximately 15% of the section. The clumps comprise fine to very fine grains of quartz, feldspars, carbonate, pyrite, pyrrhotite, Ti-oxide, Fe-ox and abundant very fine-grained biotite, sericite and unidentified material. The unidentified material/clay (< 0.005 mm) comprises approximately ~2% of the section.

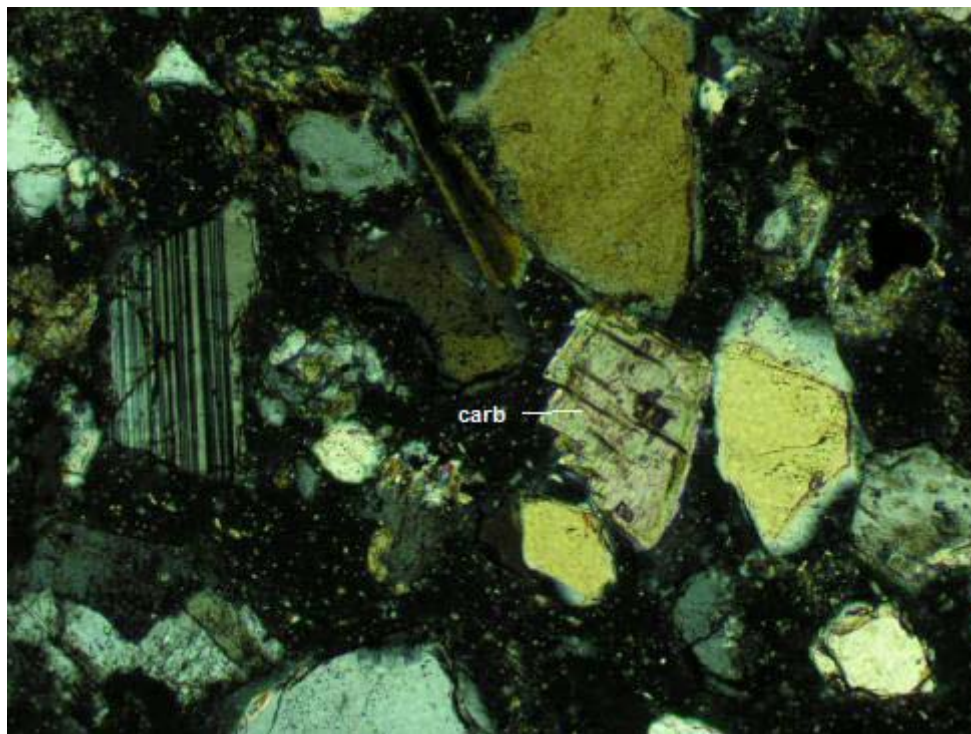
Carbonate occurs in major amounts (~5%) as colourless carbonate and lesser brown carbonate. Colourless carbonate occurs as fine-grained (< 0.5 mm) anhedral liberated grains, as liberated anhedral aggregates, as grains and aggregates within clumps of powder and as irregular patches replacing plagioclase and biotite in rock fragments. Brown carbonate occurs in lesser amounts as liberated aggregates, as patches replacing lamprophyre fragments, as grains and aggregates within clumps of powder and as patches with sericite-alteration. Some of the carbonate in fragments must be calcite based on reaction to HCl. A few carbonate grains and aggregates are rimmed and/or partly replaced by red- brown Fe-ox.

Sulphide occurs in minor amounts (~3%) as pyrite with traces of pyrrhotite and rare sphalerite, chalcopyrite and molybdenite. Pyrite, approximately 3%, occurs as liberated anhedral grains (< 0.4 mm) and as eu-anhedral grains disseminated in hornfels and granitoid chips. Liberated pyrite grains are commonly fractured; grain boundaries are irregular to straight. Pyrite rims are unaltered. Fine-grained anhedral pyrrhotite (< 0.1 mm) occurs in biotite hornfels fragments. Pyrrhotite grains are unaltered. Rare fine-grained molybdenite (< 0.3 mm) occurs as liberated plates. Rare fine-grained sphalerite and chalcopyrite occur associated as liberated aggregates.

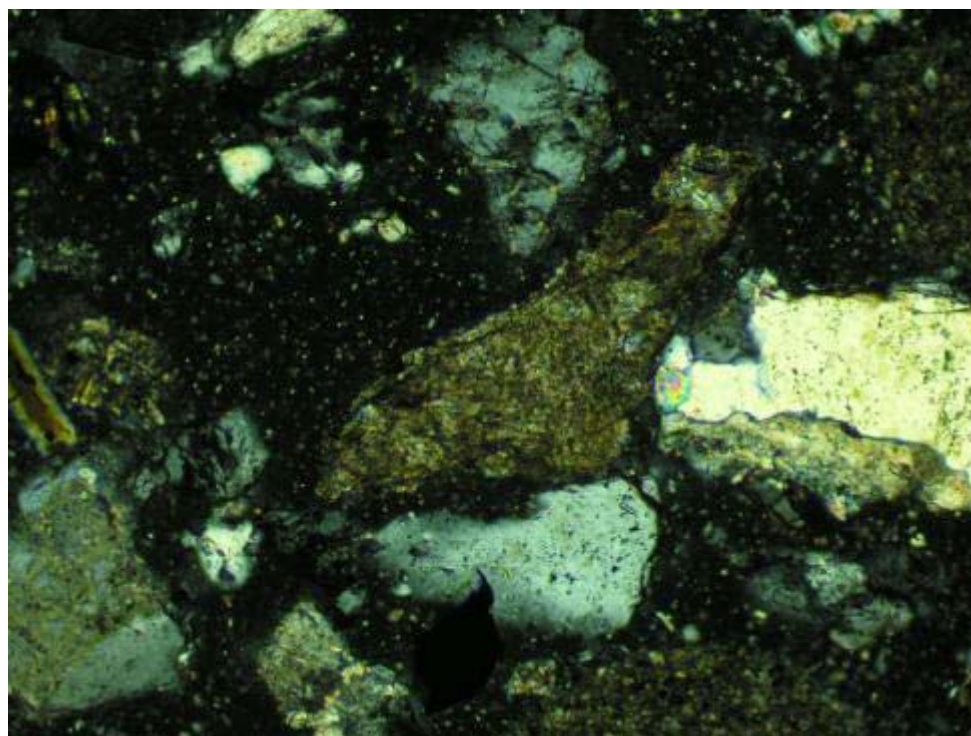
Aphanitic red-brown Fe-ox material occurs rarely as replacement of carbonate aggregate and as very fine grains scattered within powder clumps. Rare grains of fine-grained magnetite (~0.1 mm) occur as liberated grains and within granitoid fragments.



**Avanti Whole Master (+100):** Representative view of liberated fine grains of quartz, K-feldspar, biotite, chips of granitoid and hornfels chips and clumps of fine grains and powder. A) PPL, B) XPL, FOV  $\approx$  4.5 mm.

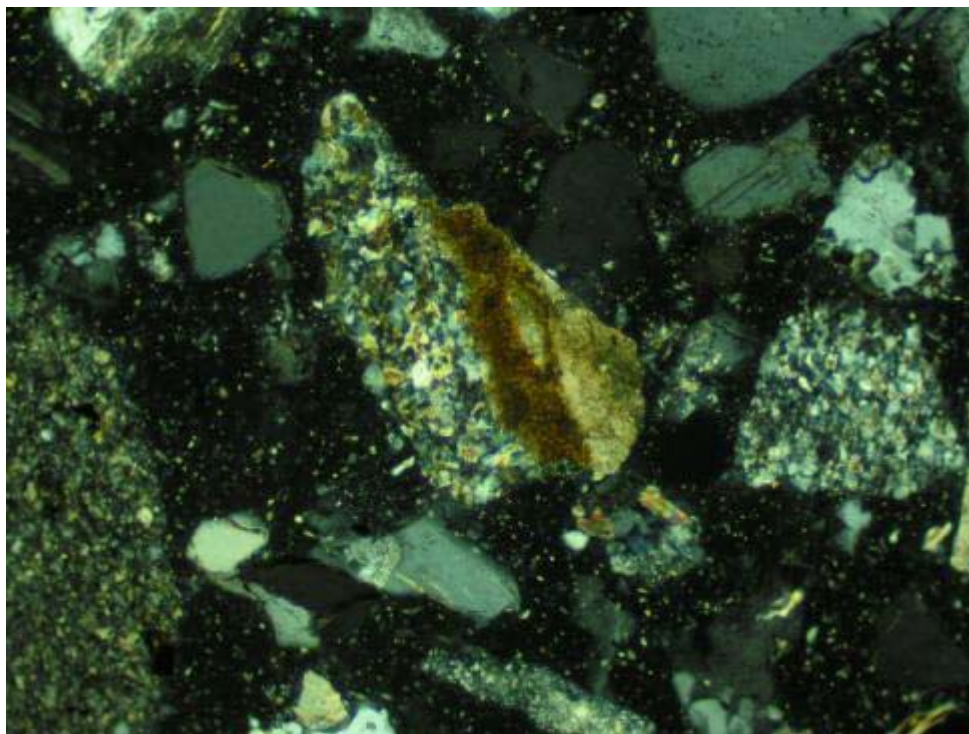


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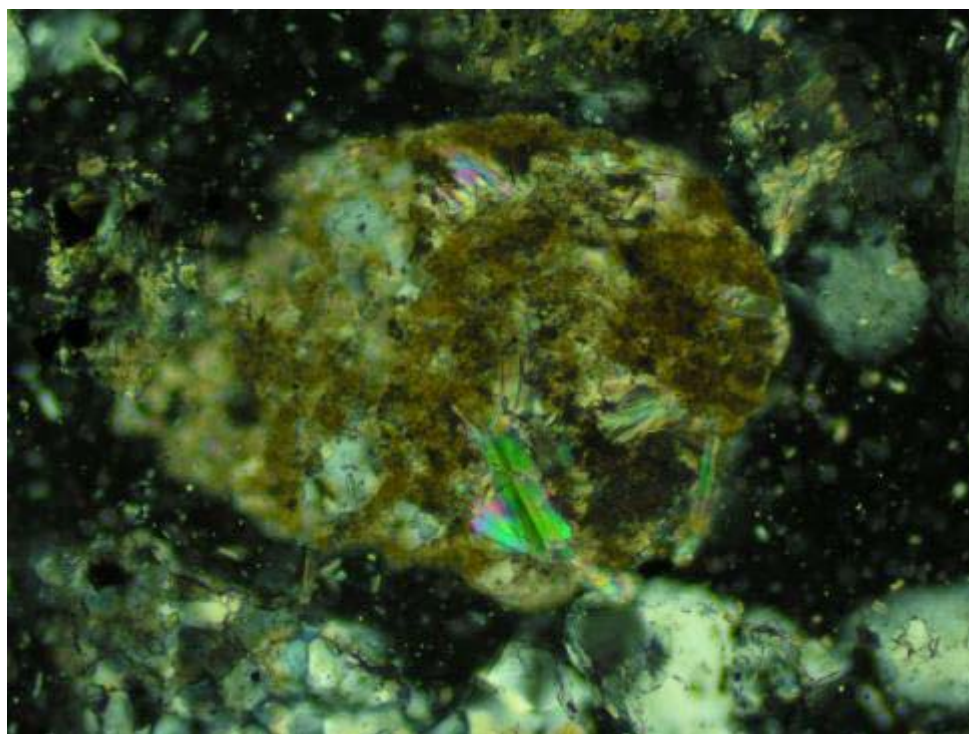


D

**Avanti Whole Master (+100):** C) Liberated grains of plagioclase (left), quartz, K-feldspar, biotite (top) and carbonate. XPL, FOV  $\approx$  1.3 mm, D) Liberated brown carbonate aggregate (centre). XPL, FOV  $\approx$  1.3 mm

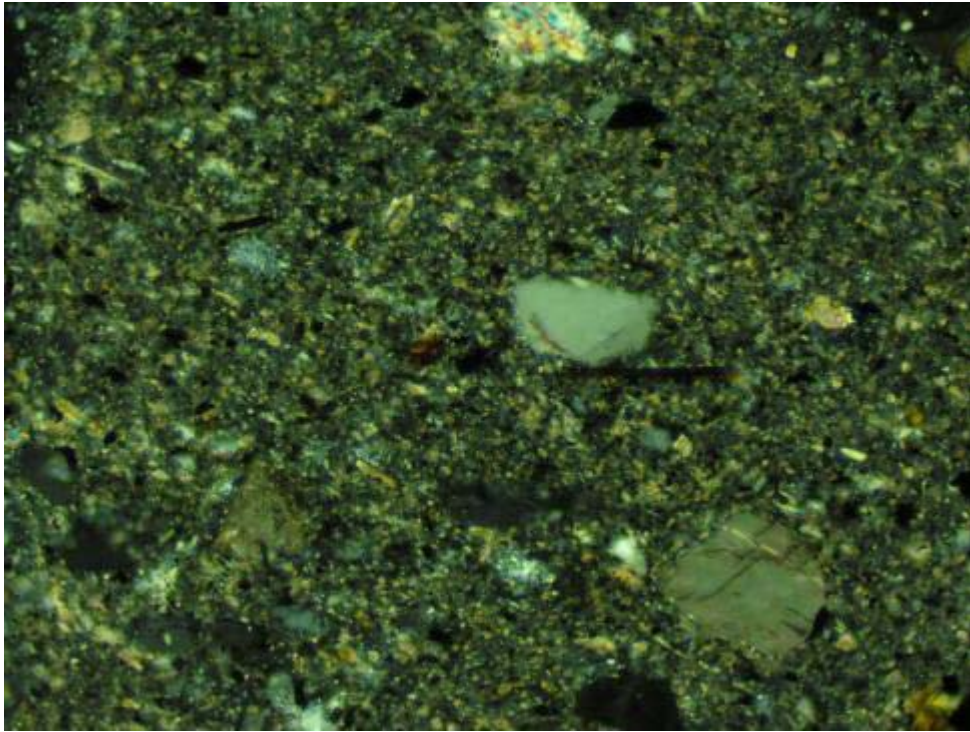


E

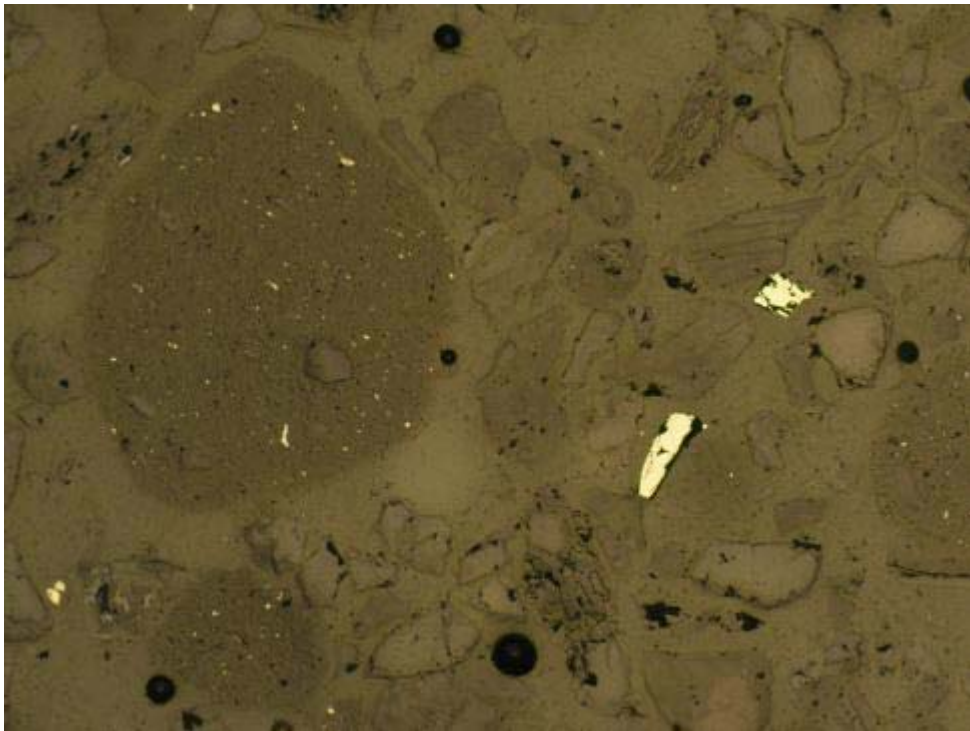


F

**Avanti Whole Master (+100):** E) Fragment of carbonate veinlet partly replaced by red-brown Fe-ox adjacent to hornfels. XPL. FOV  $\approx$  1.3 mm. F) Carbonate aggregate partly replaced by very fine-grained red-brown Fe-ox within rock fragment. XPL. FOV  $\approx$  0.7 mm.

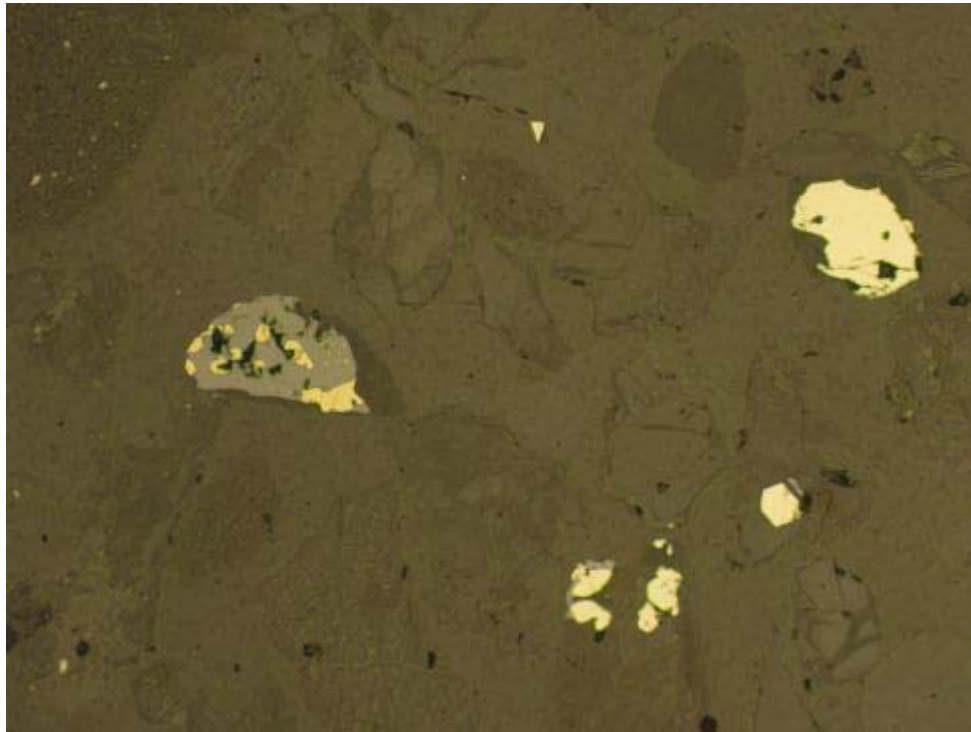


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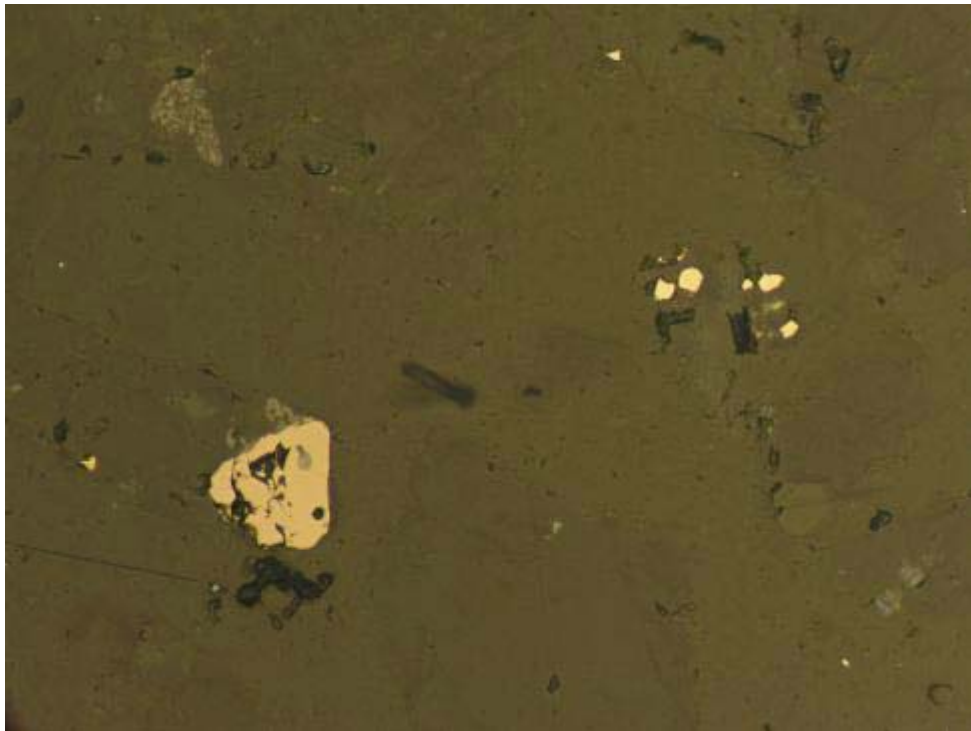


H

**Avanti Whole Master (+100):** G) Detailed view of fine to very fine grains within clump of powder. XPL. FOV  $\approx$  0.7 mm. H) Distribution of liberated anhedral pyrite grains and very fine-grained pyrite within powder clump (left). RL. FOV  $\approx$  2.6 mm.



I



J

**Avanti Whole Master (+100):** I) Liberated sphalerite associated with chalcopyrite (left) and pyrite disseminated in rock fragments (right). RL. FOV  $\approx$  1.3 mm. J) Pyrrhotite grain (left) and pyrite grains (right) within fine rock chips. RL. FOV  $\approx$  0.7 mm.

**Statement of qualifications: Kathryn P.E. Dunne**

I, Kathryn P.E. Dunne, of the City of Salmon Arm, province of British Columbia, do hereby certify that:

1. I am an independent consulting geologist, with a business office at 4610 Lakeshore Road NE, Salmon Arm, B.C., Canada. My business mailing address is: Bag 9000, # 207, 190B Trans Can Hwy NE, Salmon Arm, BC, V1E 1S3.
2. I am a graduate in geology, with a BSc in geology from The University of British Columbia (1985).
3. I received my Masters degree in geology from The University of British Columbia, Vancouver, B.C. in 1988.
4. I am a registered member of the Association of Professional Engineers and Geoscientists of the Province of British Columbia (No. 18674).
5. I am a fellow of the Geological Association of Canada and a member of the Society of Economic Geologists.
6. I have practiced my profession as a geologist for approximately 20 years: 4 years as geologist with the British Columbia Geological Survey Branch, 3 years as research coordinator at the Mineral Deposit Research Unit housed within the Department of Earth and Ocean Sciences at the University of British Columbia, and 13 years as an independent consultant.
7. The petrographic data of this report was collected by me in March and April 2010.

.....  
Kathryn P.E. Dunne, M.Sc., P.Geol.  
Consulting Geologist  
April 14, 2010

**Summary of Carbonate Grain Selection  
for Microprobe Work**

**11 CRUSHED ROCK SAMPLES**

**KITSAULT PROJECT, BC**

July 26, 2010

*SGS Canada Inc. Project #:*  
0935 Avanti Mining

*Prepared for:*  
*Mati Raudsepp, Professor (Hon.)*  
*Director: Electron-microbeam/X-ray Diffraction Facility*  
*Department of Earth & Ocean Sciences*  
*6339 Stores Road, The University of British Columbia*  
*Vancouver, BC V6T 1Z4*

*AND*

*Rik Vos*  
*SGS Canada Inc.*  
*6927 Antrim Avenue*  
*Burnaby, BC*  
*Canada V5J 4M5*

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*Prepared by:*  
*Kathryn Dunne, M.Sc. P.Geo.*  
*Consulting Geologist*  
*Bag 9000, Suite 207*  
*190B Trans Can Hwy NE*  
*Salmon Arm, BC*  
*Canada V1E 1S3*

phone: 250-804-0729  
kgeo@telus.net

TABLE OF CONTENTS:

#	SAMPLE #	PAGE #
1	K08-17 141-144	3
2	K08-17 168-171	7
3	K08-30 159-162	11
4	K08-04 135-138	15
5	K08-10 219-222	19
6	K08-09 78-81	23
7	K08-28 30-33	27
8	K08-02 204-207	31
9	K08-09 69-72	35
10	Patsy Dump 05	39
11	Clary Dump 06	43

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-17 141-144

#1



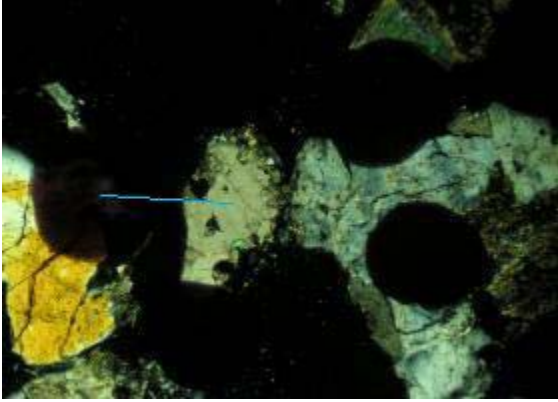
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Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

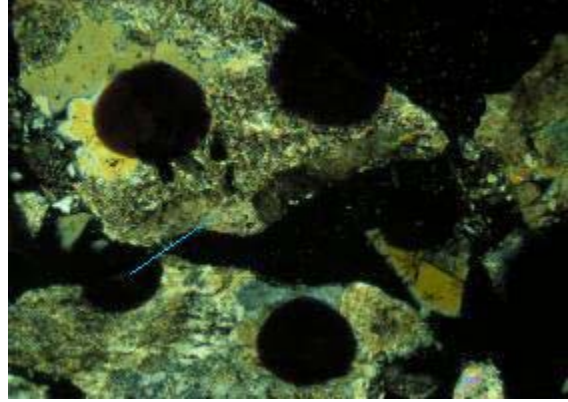
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-17 141-144

#1

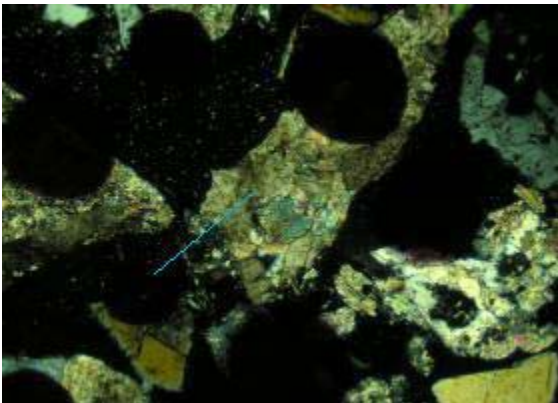
Grains for Carbonate Identification: → (right side of section)



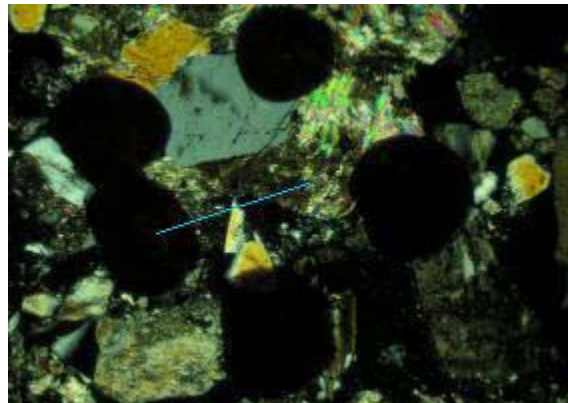
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Blue line from ink dot to carbonate grain



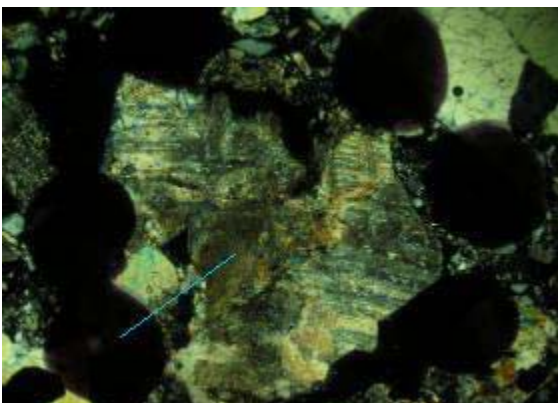
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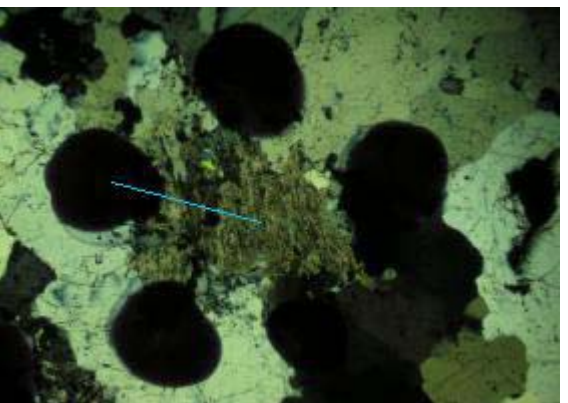
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Blue line from ink dot to carbonate grain



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Circle #5 (XPL) FOV = 2.0 mm  
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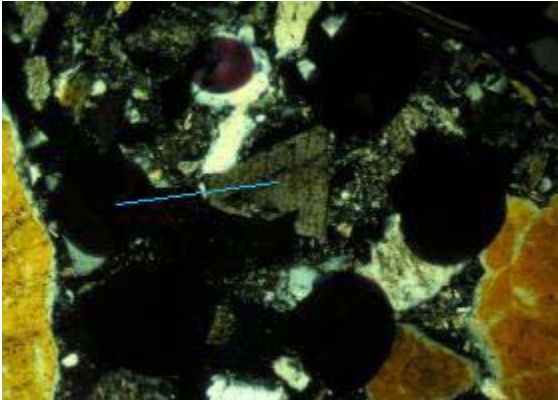


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Blue line from ink dot to carbonate grain

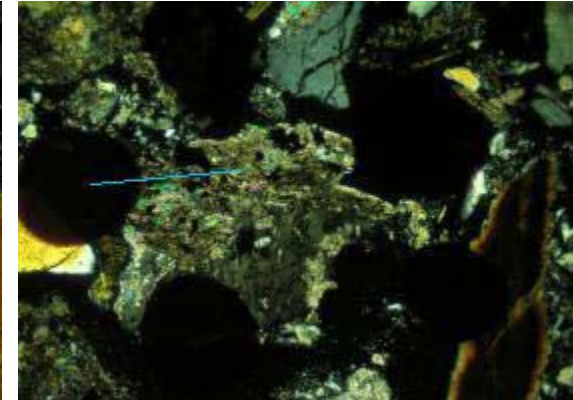
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SAMPLE #: K08-17 141-144

#1

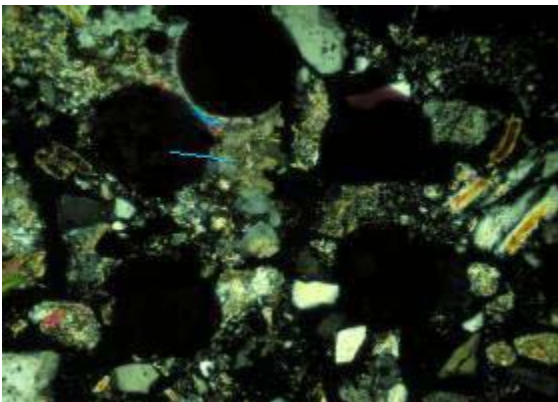
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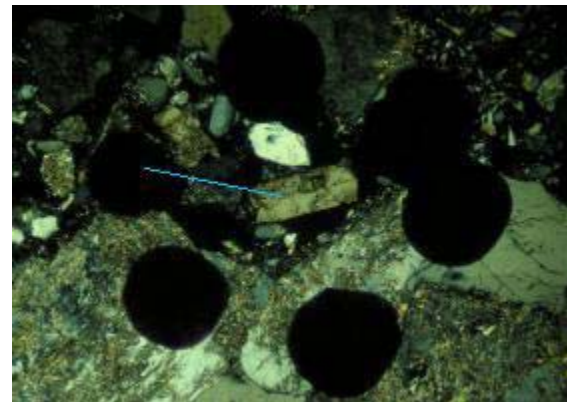
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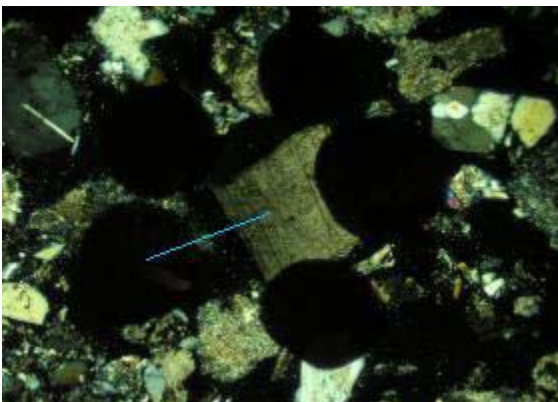
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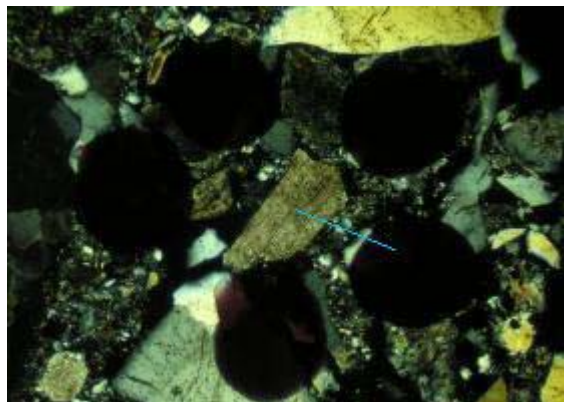
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Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



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Blue line from ink dot to carbonate grain

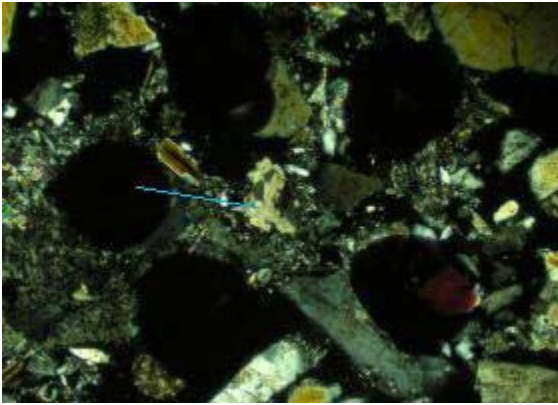


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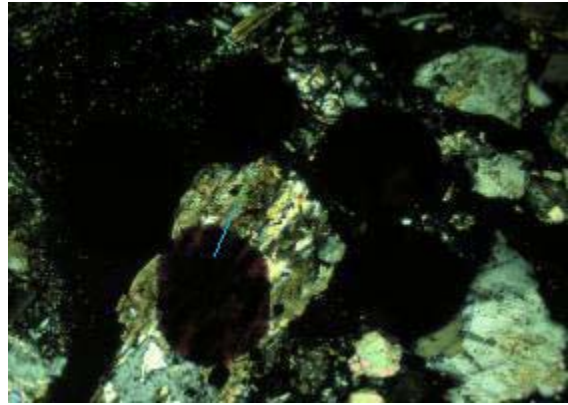
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SAMPLE #: K08-17 141-144

#1

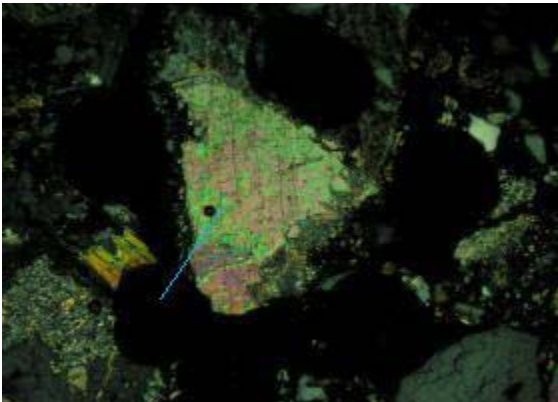
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti

SAMPLE #: K08-17 168-171

#2



→ (right side of section)

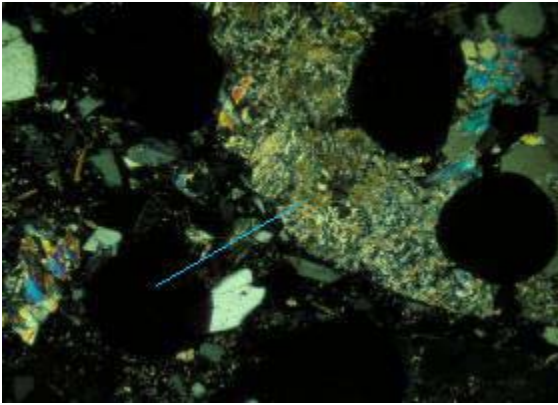
Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

Red patches highlight location of circles in this dark section.

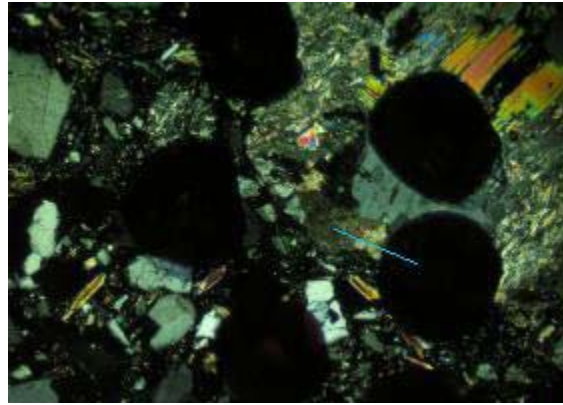
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SAMPLE #: K08-17 168-171

#2

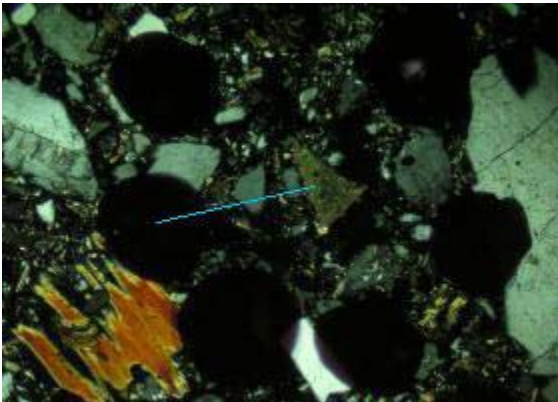
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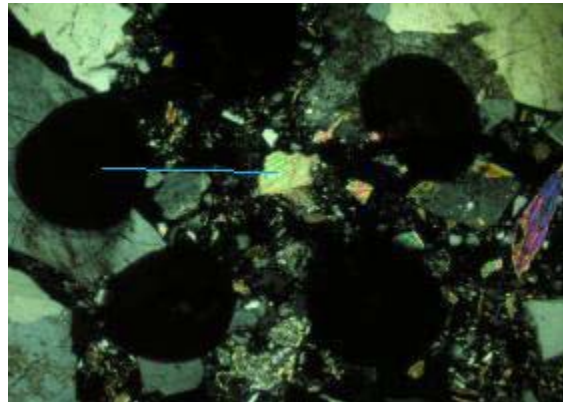
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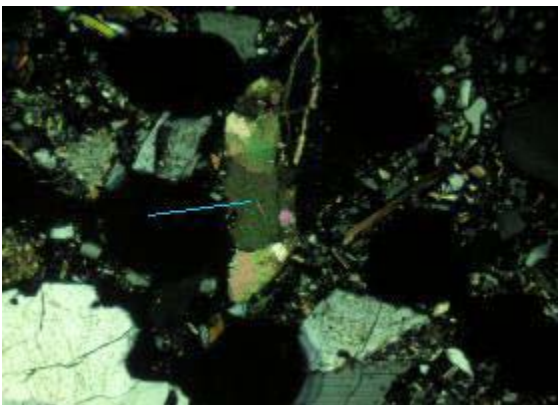
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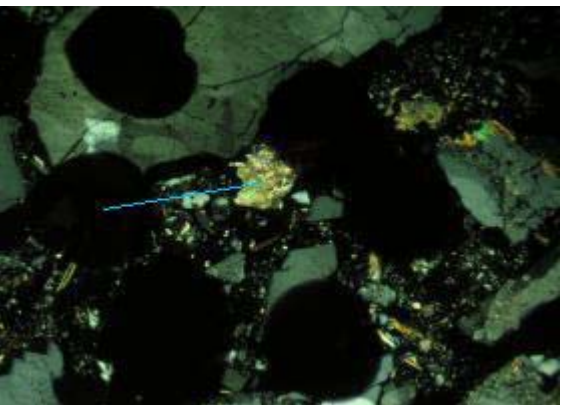
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Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

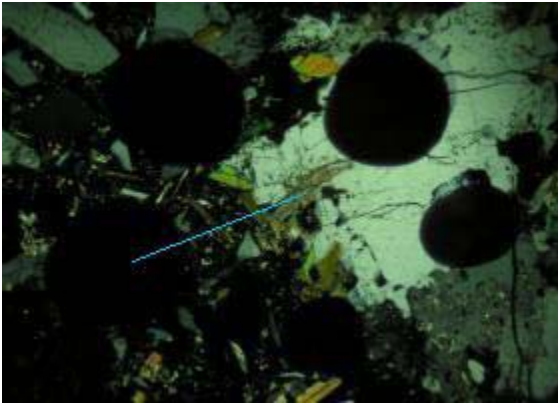


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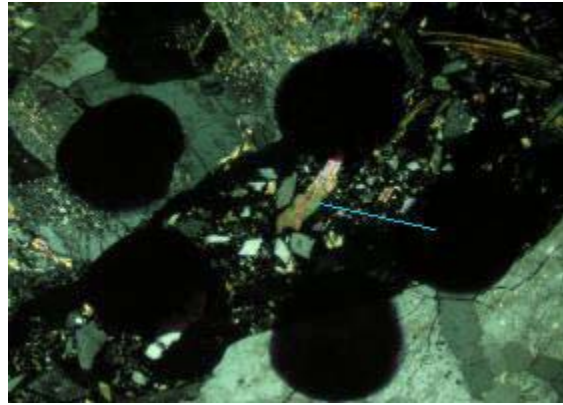
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SAMPLE #: K08-17 168-171

#2

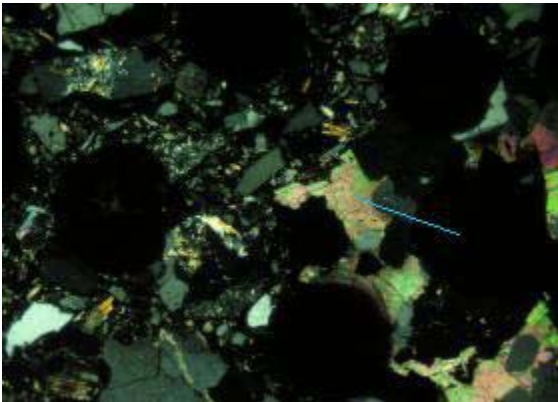
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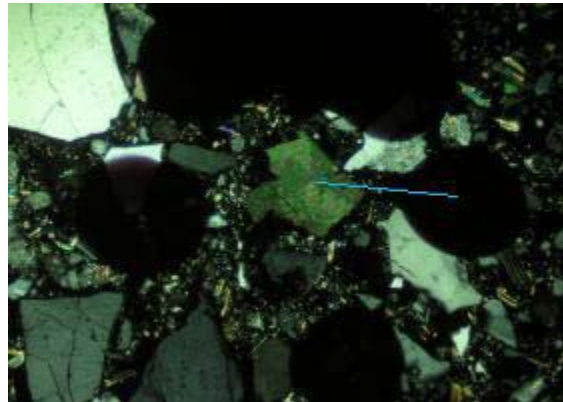
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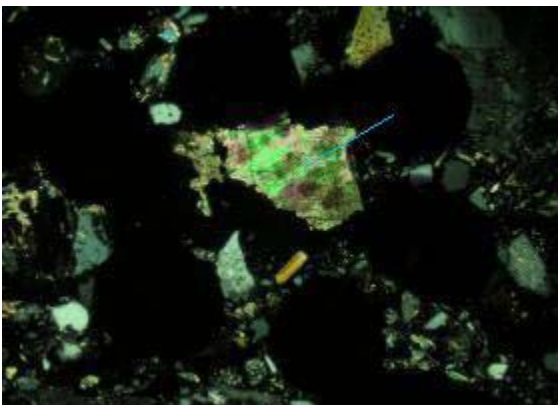
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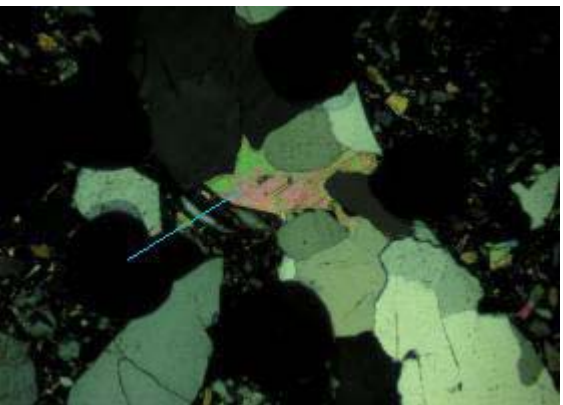
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Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
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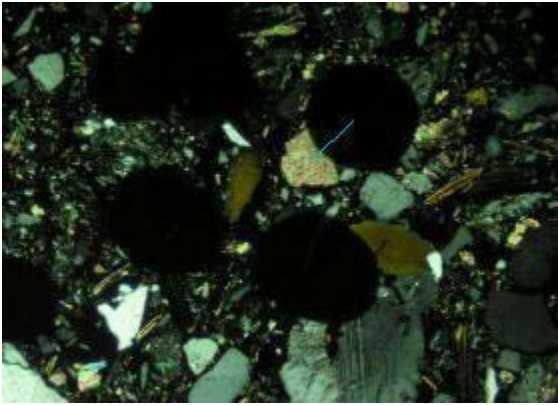


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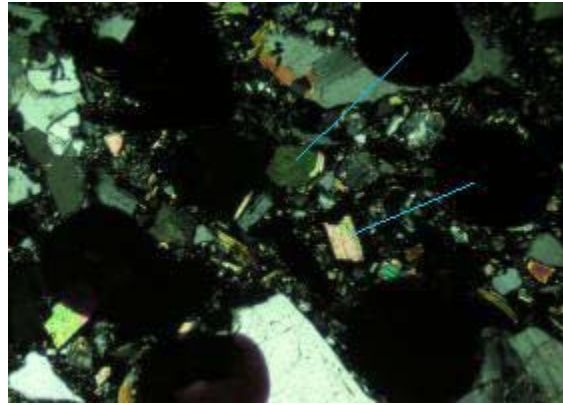
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-17 168-171

#2

Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue lines from ink dot to carbonate grains  
→ 2 grains

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-30 159-162

#3



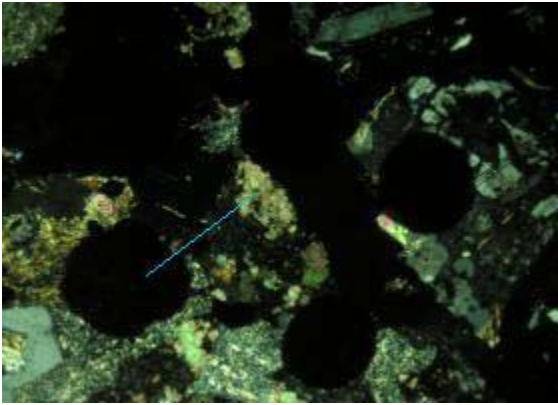
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Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

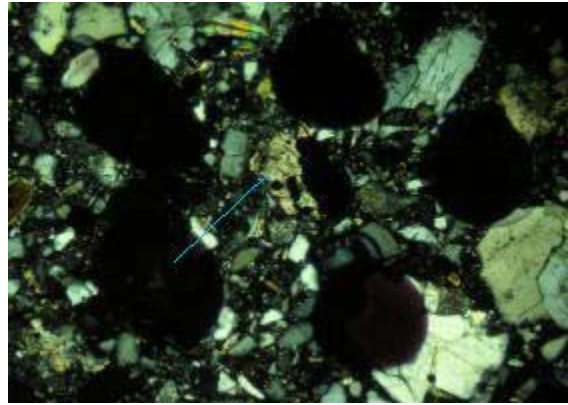
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-30 159-162

#3

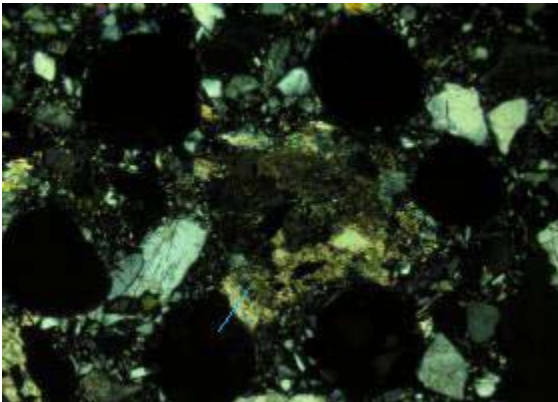
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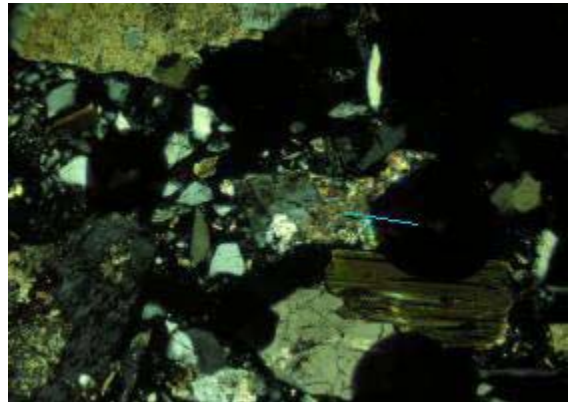
Circle #1 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



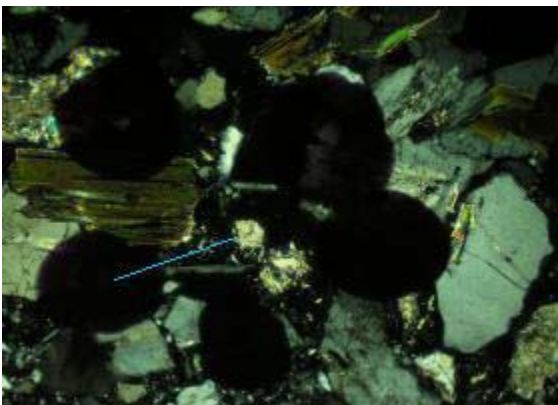
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Blue line from ink dot to carbonate grain



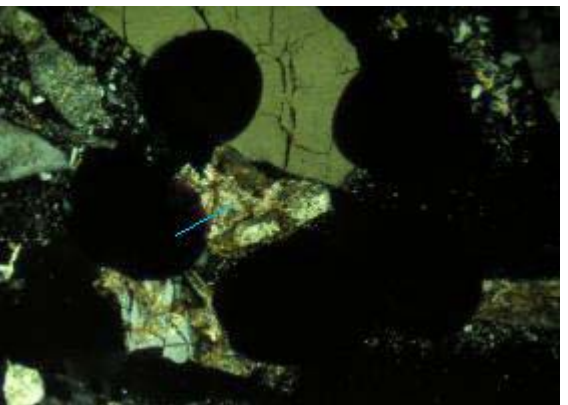
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Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

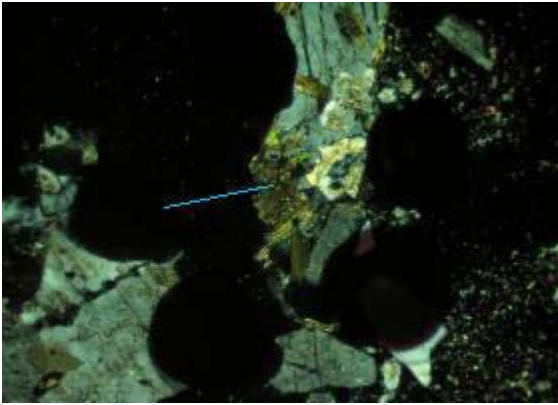


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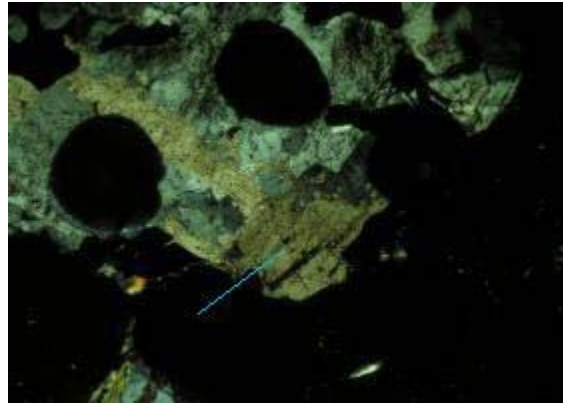
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SAMPLE #: K08-30 159-162

#3

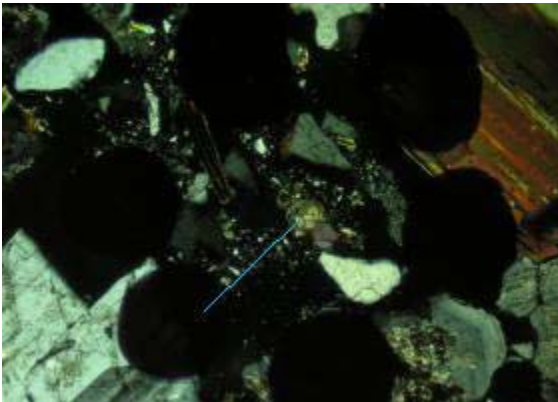
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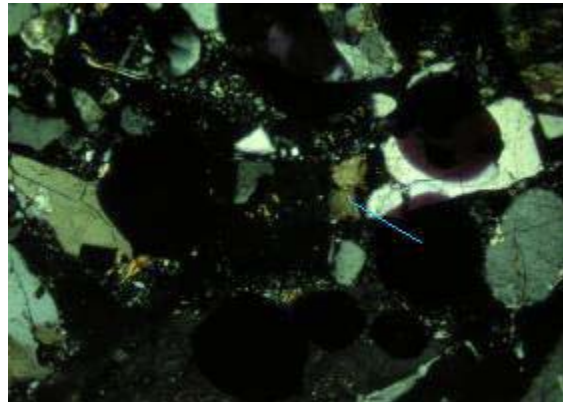
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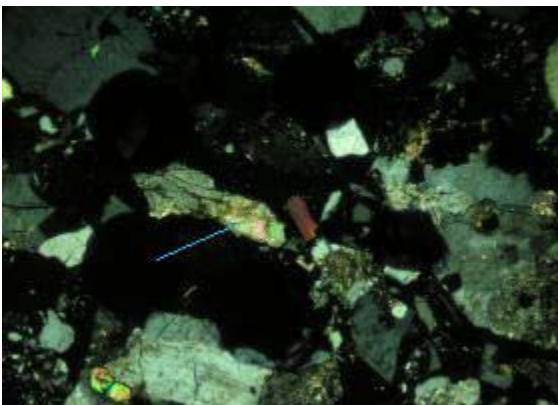
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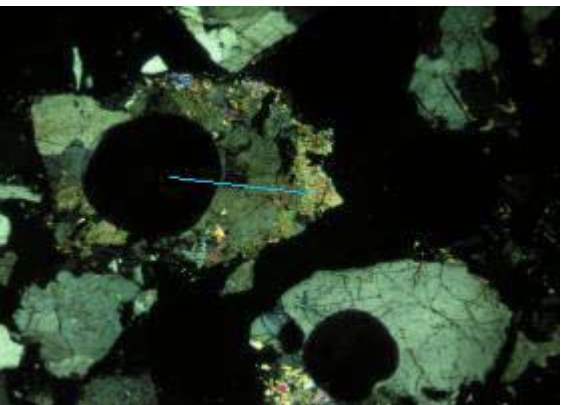
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Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

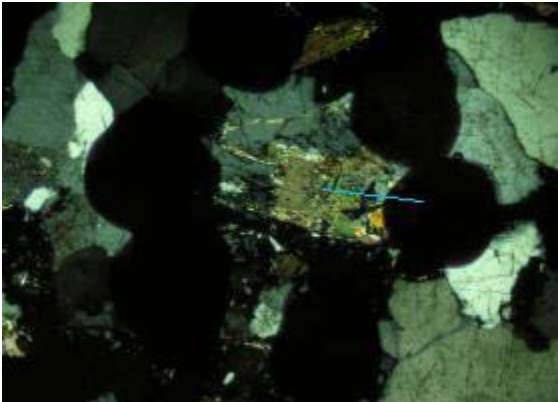


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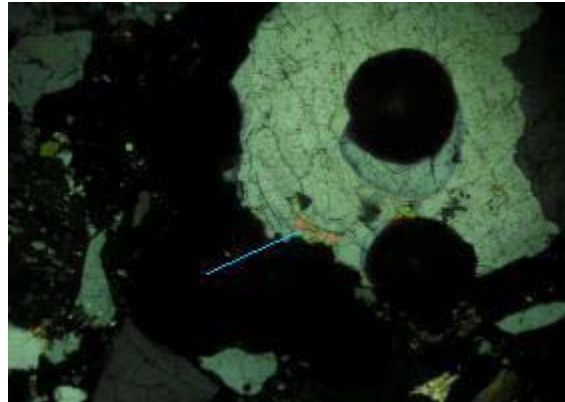
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#3

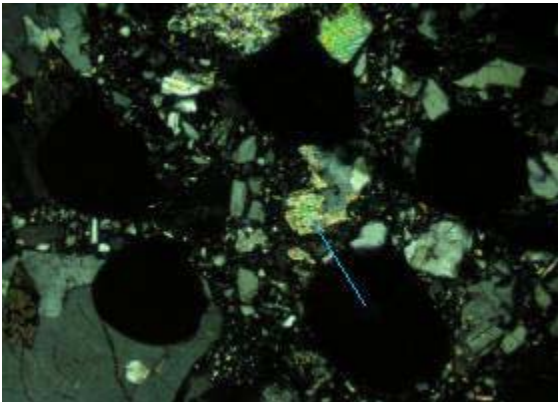
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
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Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-04 135-138

#4



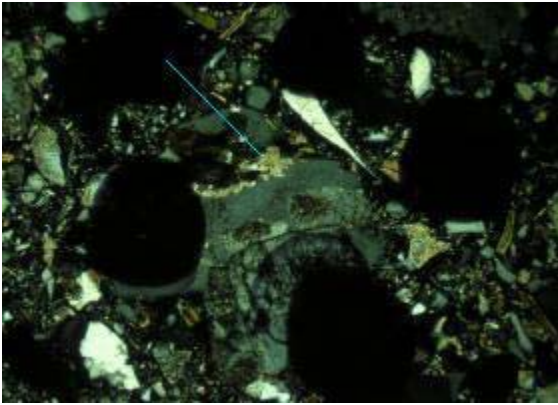
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Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

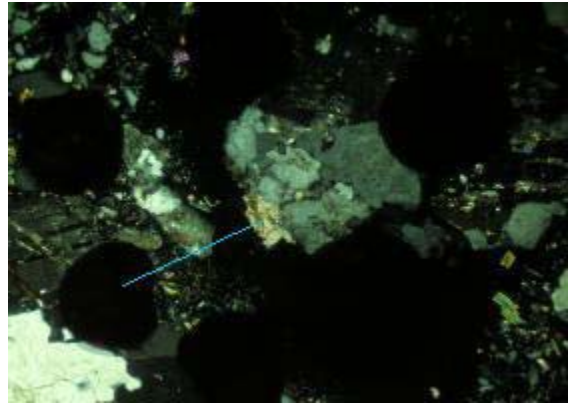
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-04 135-138

#4

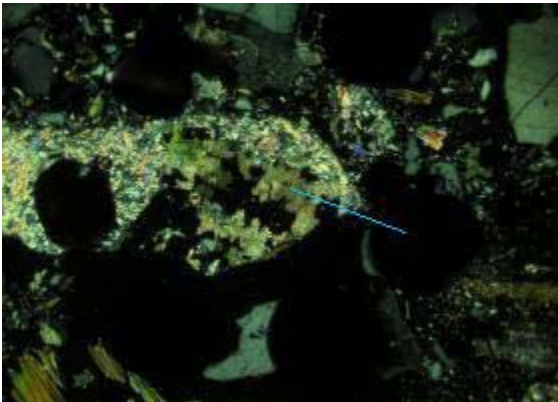
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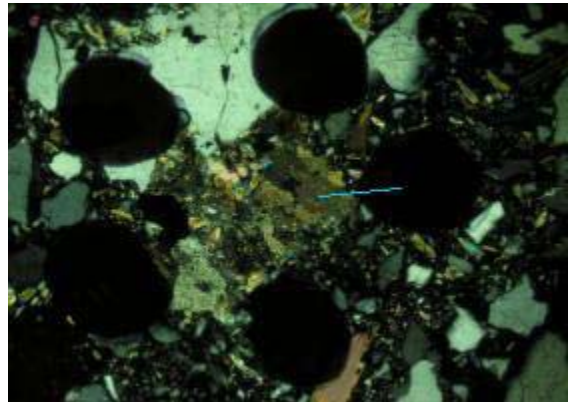
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Blue line from ink dot to carbonate grain



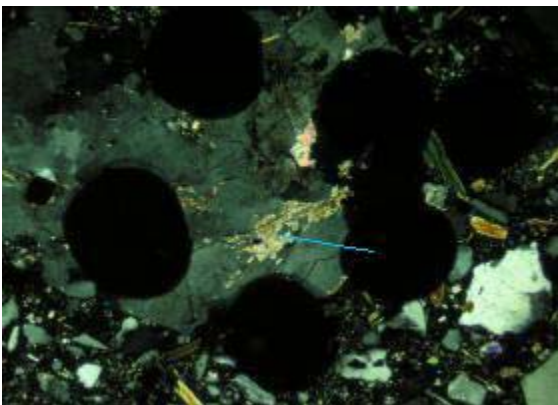
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Blue line from ink dot to carbonate grain



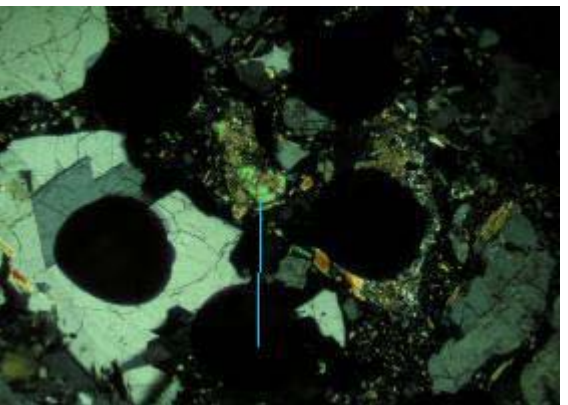
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Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

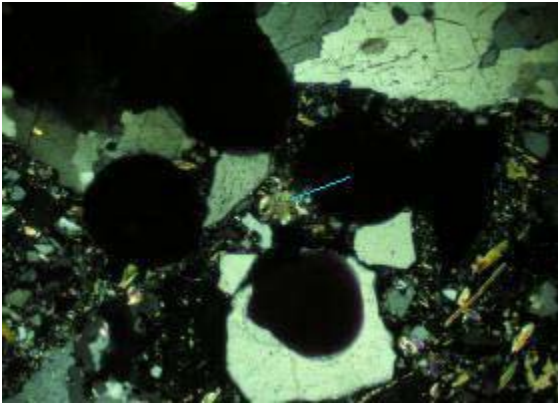


Circle #6 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

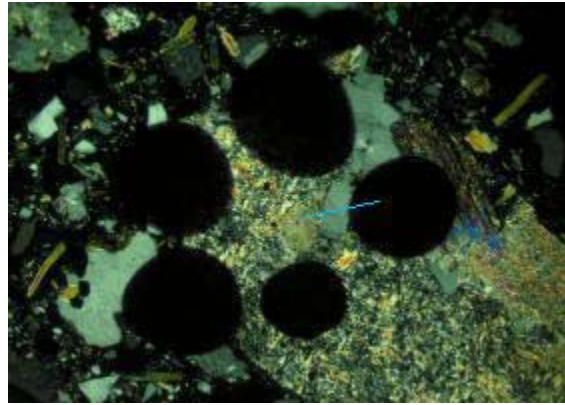
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-04 135-138

#4

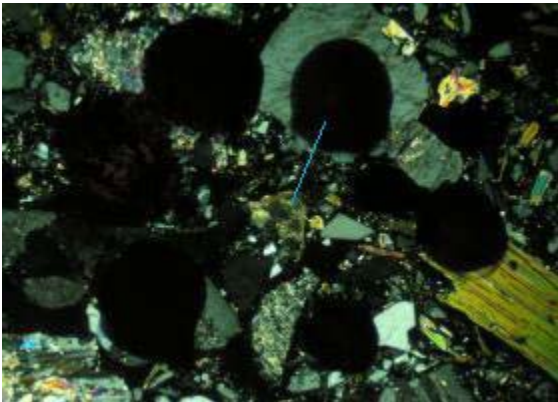
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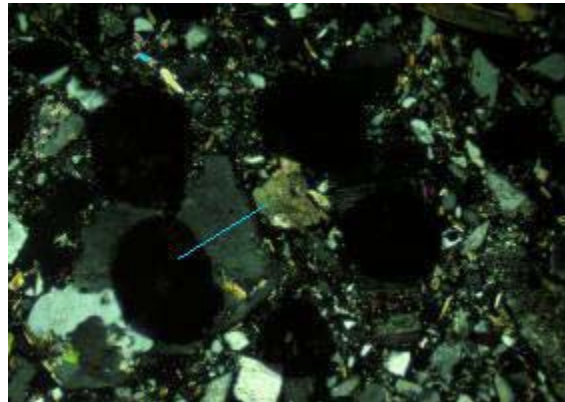
Circle #7 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



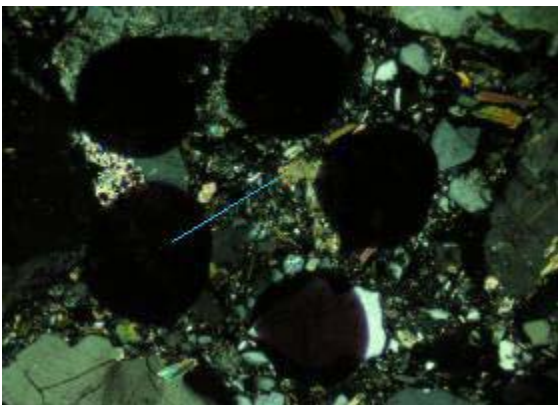
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Blue line from ink dot to carbonate grain



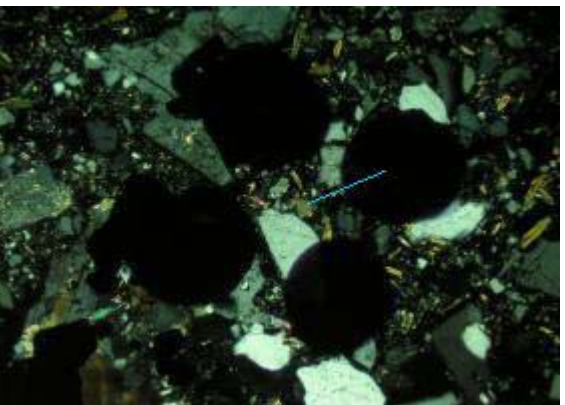
Circle #9 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

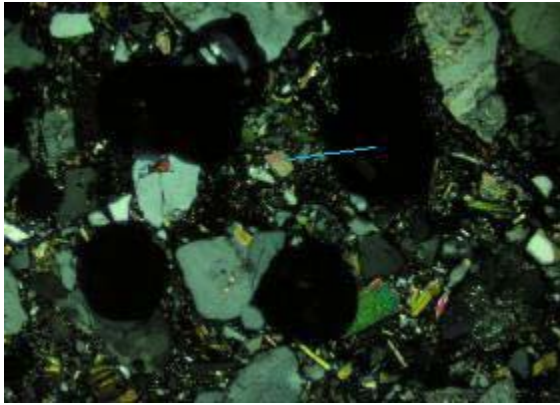


Circle #12 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

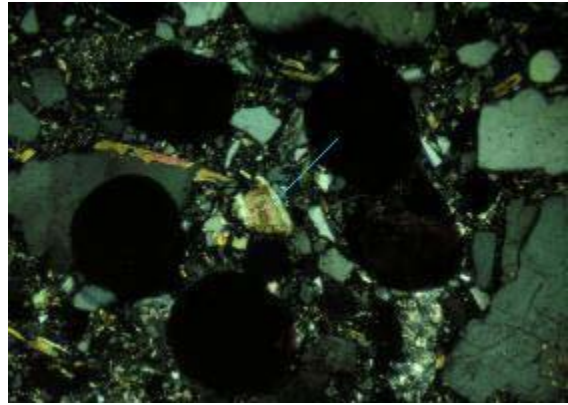
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-04 135-138

#4

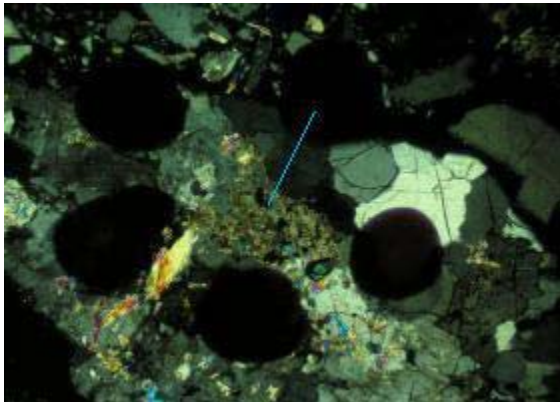
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



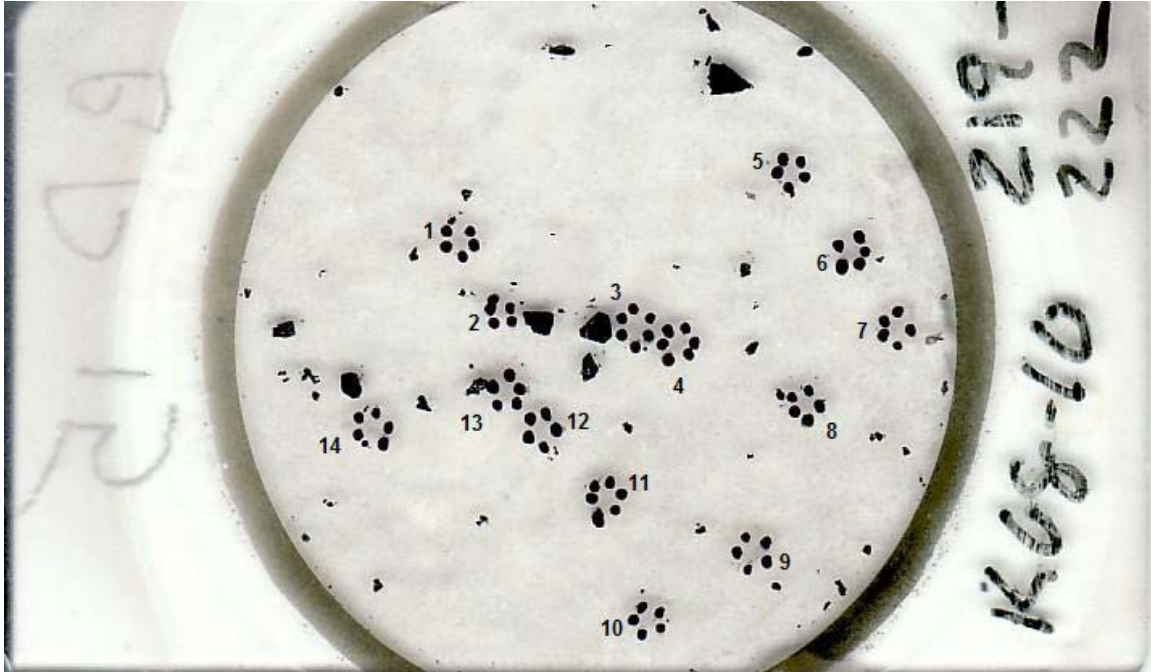
Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-10 219-222

#5



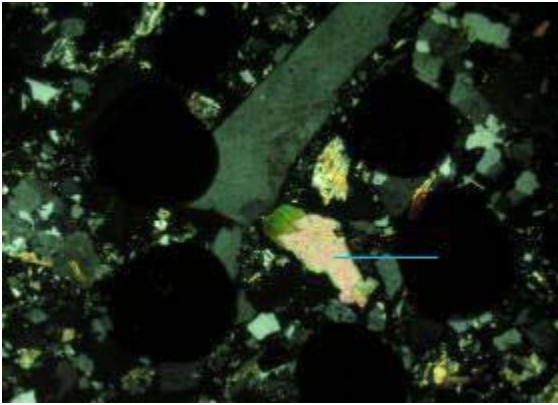
→ (right side of section)

Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

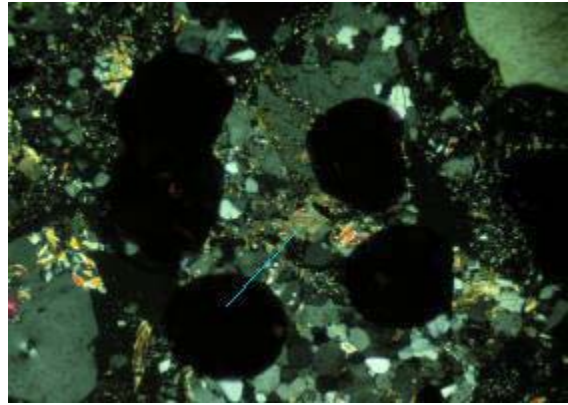
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-10 219-222

#5

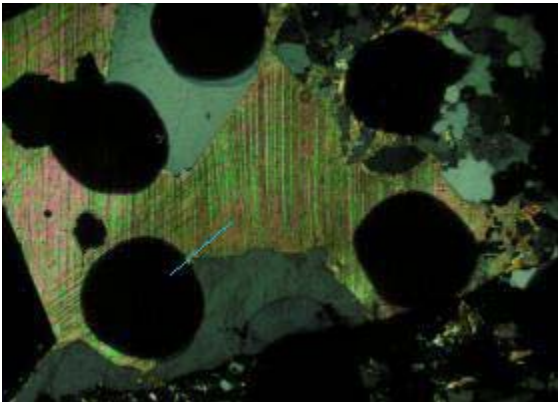
Grains for Carbonate Identification: → (right side of section)



Circle #1 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



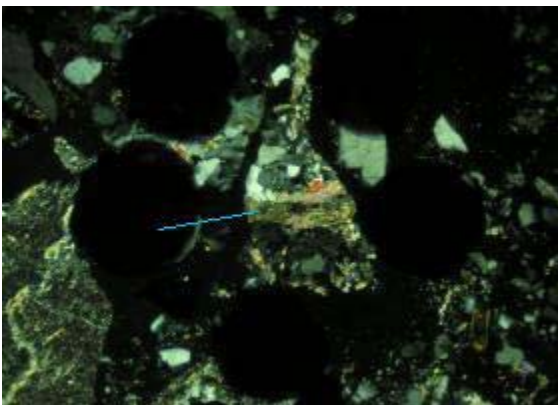
Circle #2 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



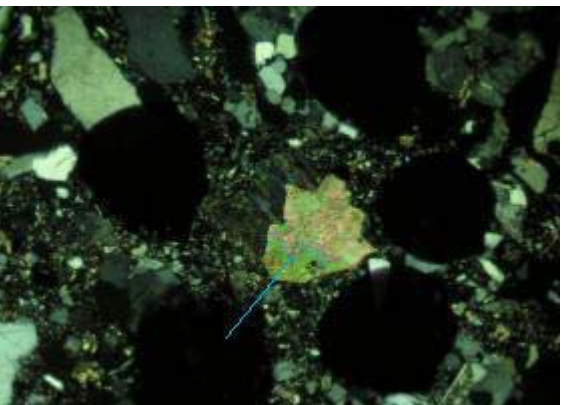
Circle #3 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

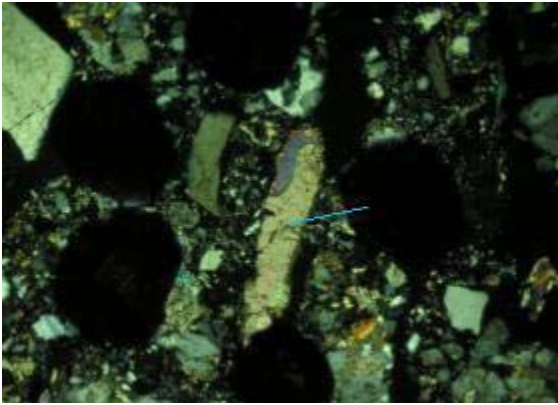


Circle #6 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

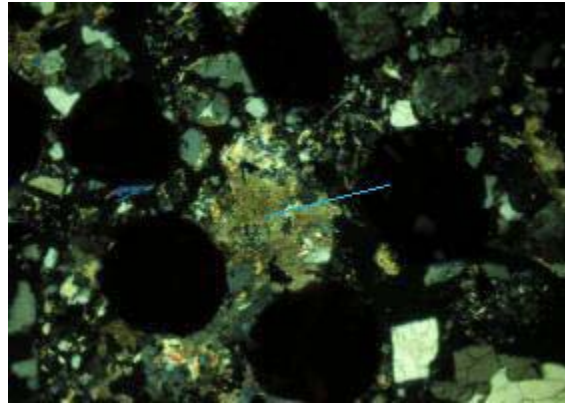
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-10 219-222

#5

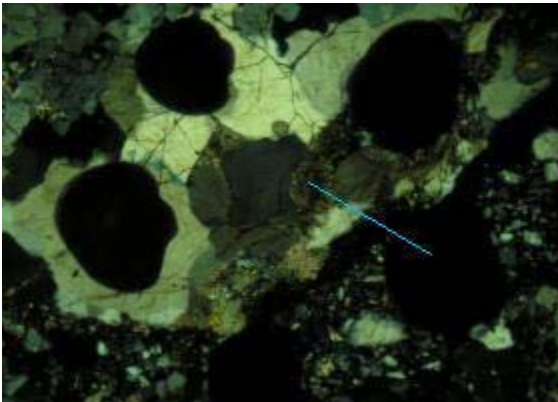
Grains for Carbonate Identification: → (right side of section)



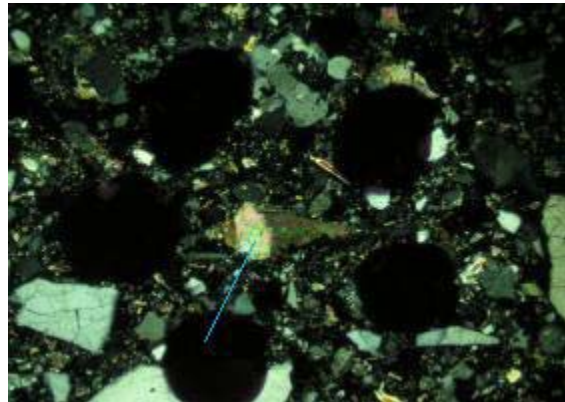
Circle #7 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



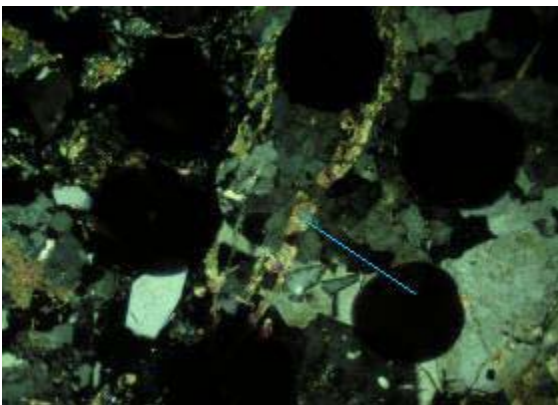
Circle #8 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



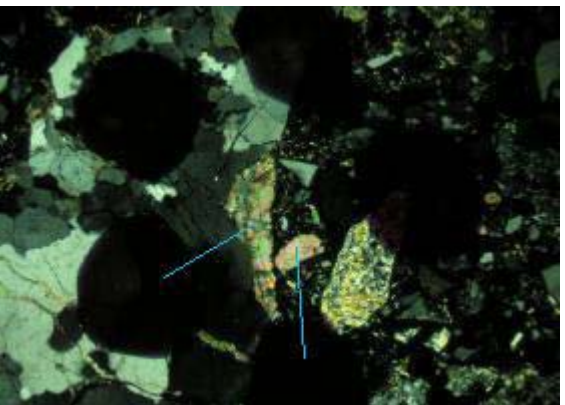
Circle #9 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

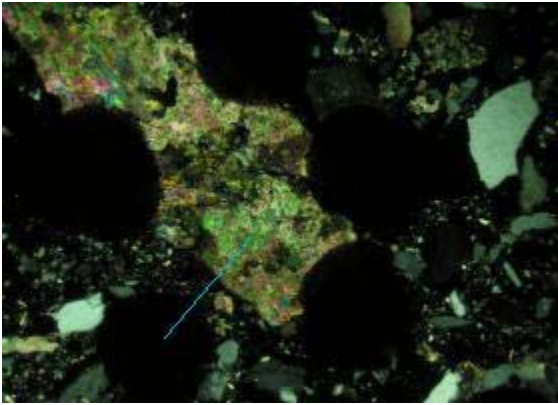


Circle #12 (XPL) FOV = 2.0 mm  
Blue lines from ink dot to carbonate grains  
→ 2 grains

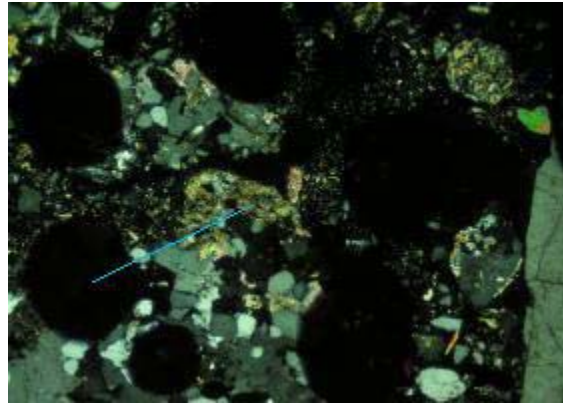
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-10 219-222

#5

Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 78-81

#6



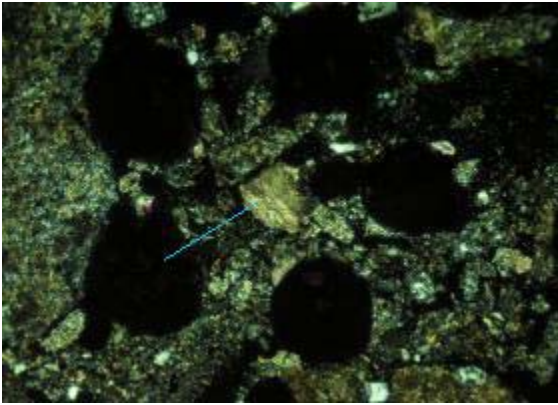
→ (right side of section)

Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

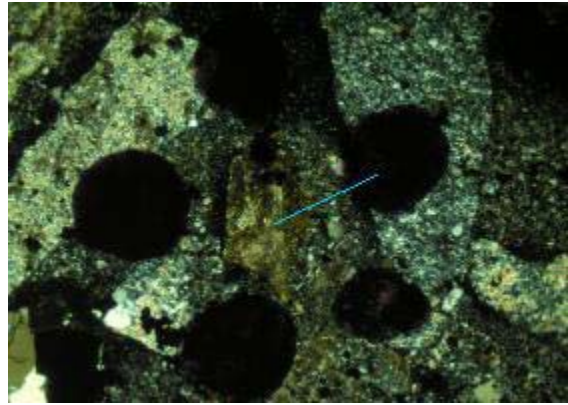
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 78-81

#6

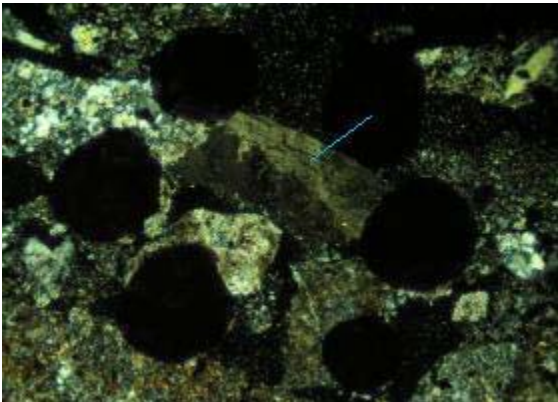
Grains for Carbonate Identification: → (right side of section)



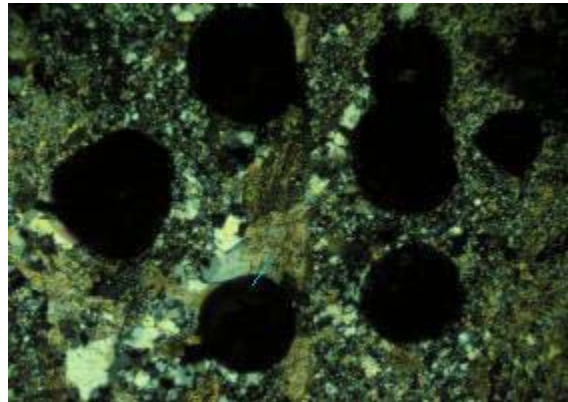
Circle #1 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



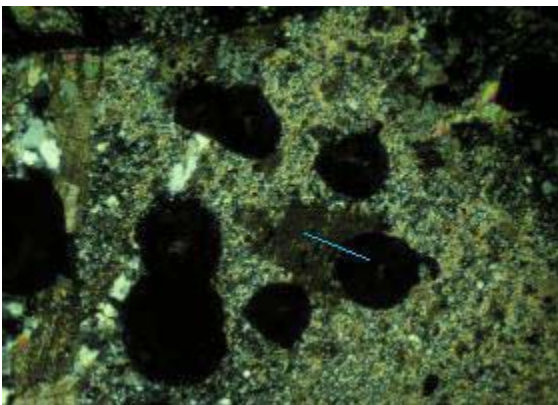
Circle #2 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



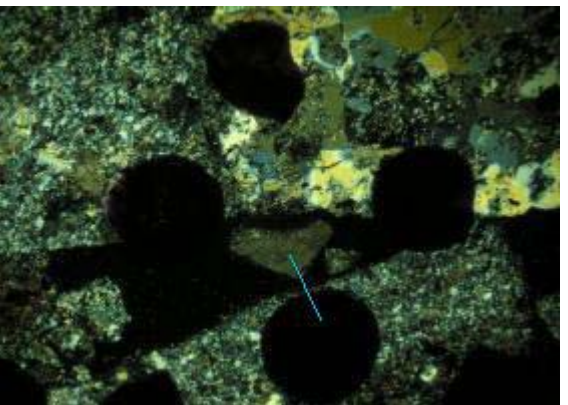
Circle #3 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

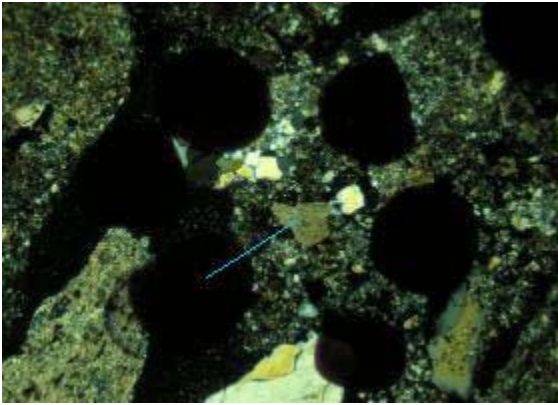


Circle #6 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

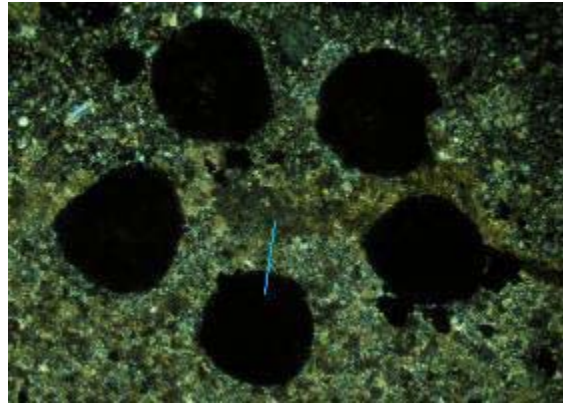
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 78-81

#6

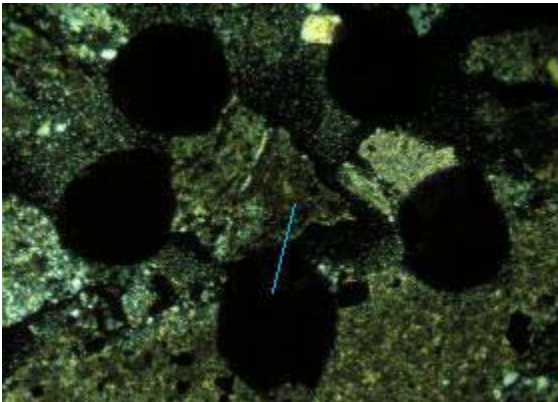
Grains for Carbonate Identification: → (right side of section)



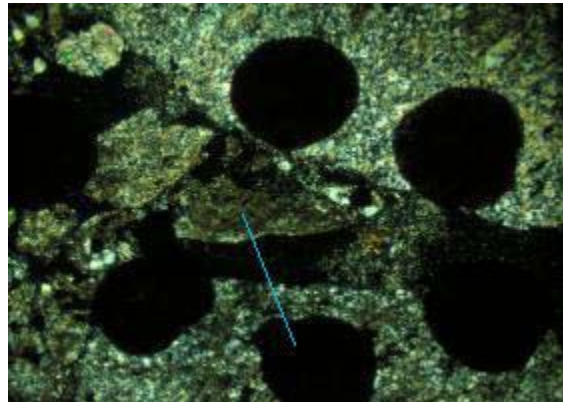
Circle #7 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



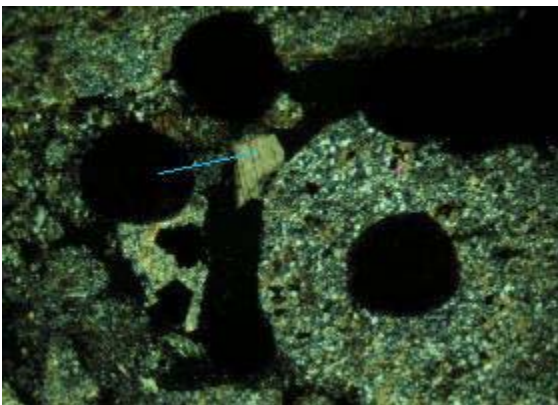
Circle #8 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



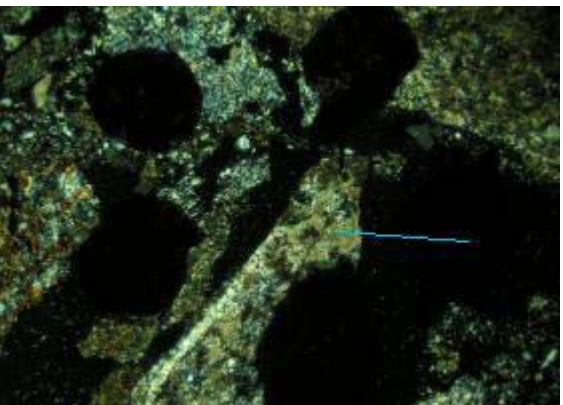
Circle #9 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

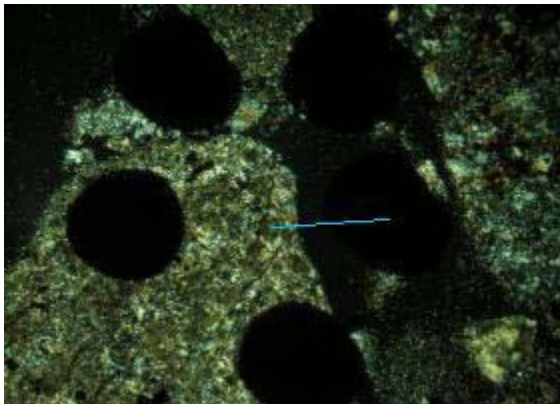


Circle #12 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

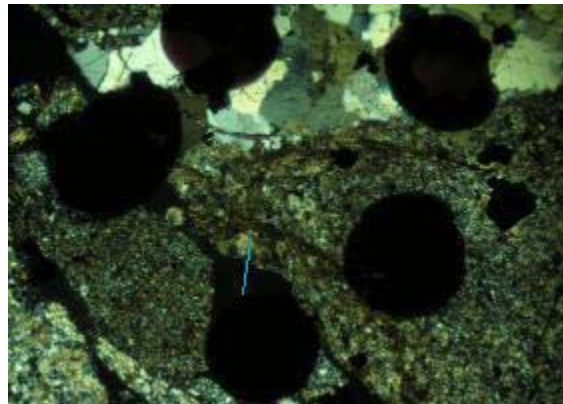
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 78-81

#6

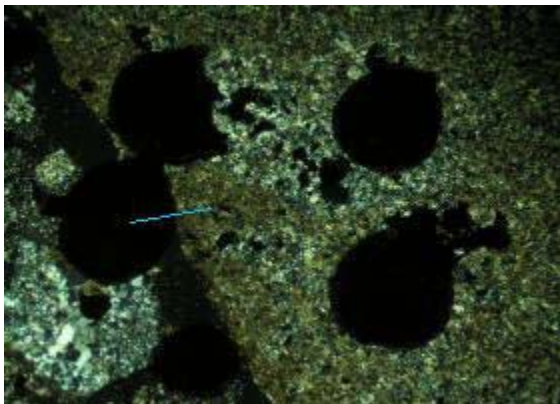
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



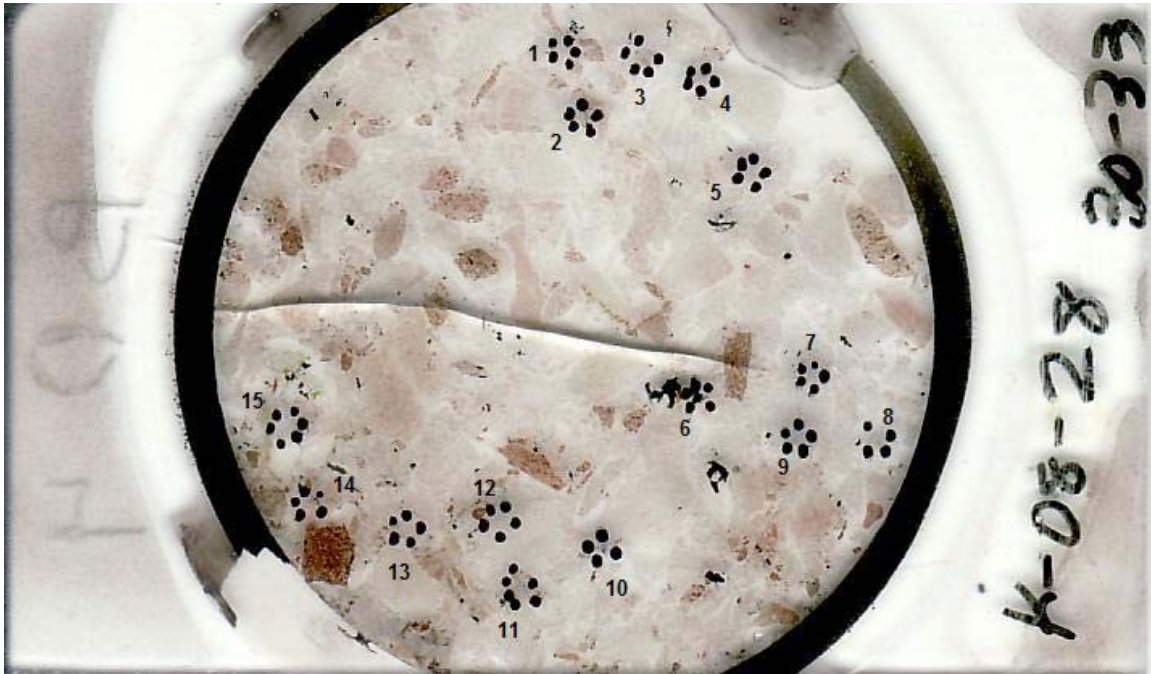
Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-28 30-33

#7



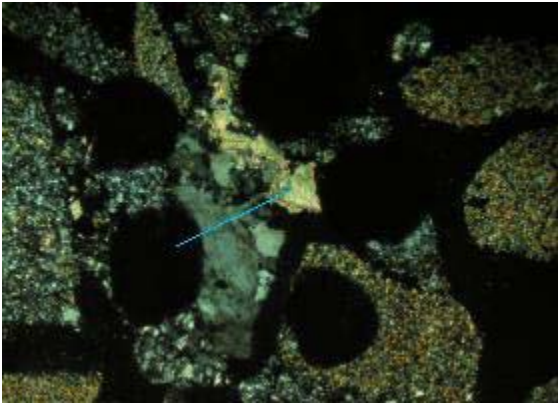
→ (right side of section)

Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

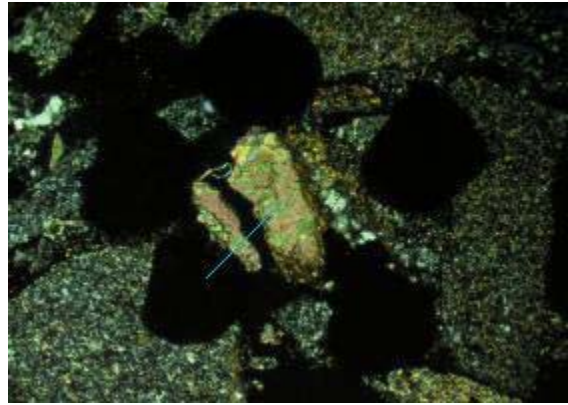
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-28 30-33

#7

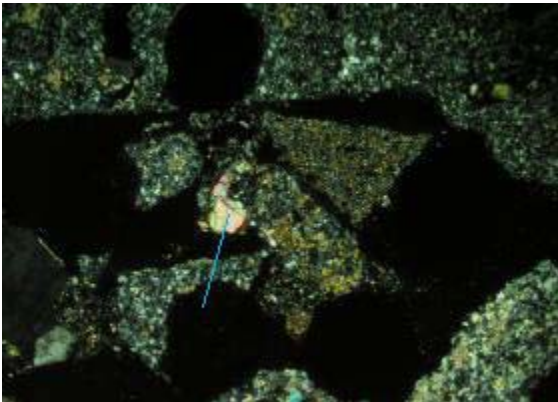
Grains for Carbonate Identification: → (right side of section)



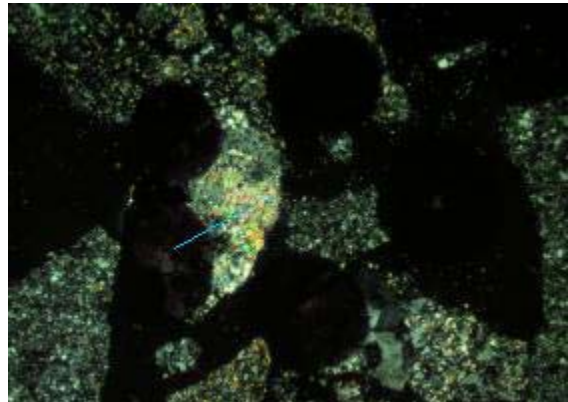
Circle #1 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



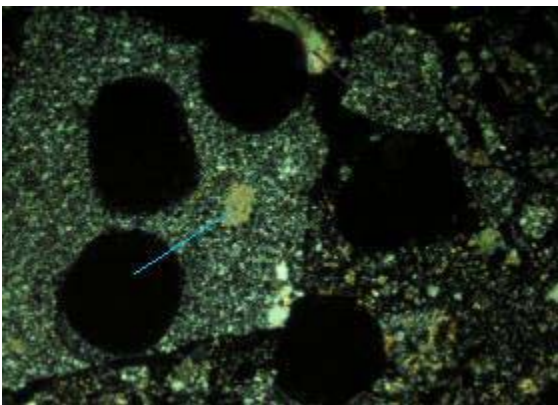
Circle #2 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



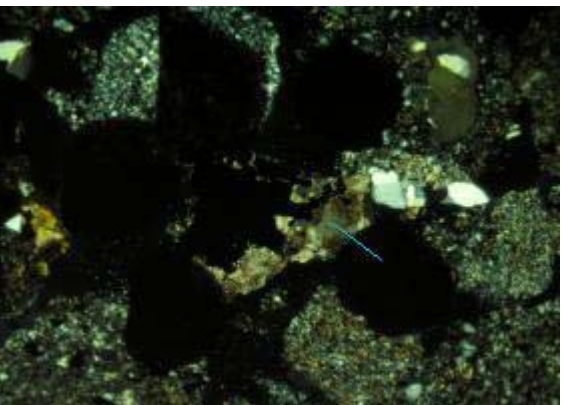
Circle #3 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

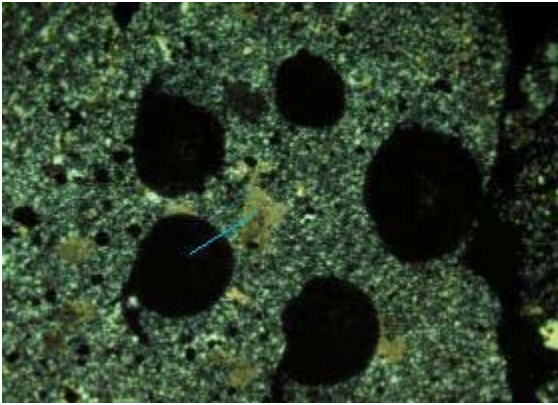


Circle #6 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

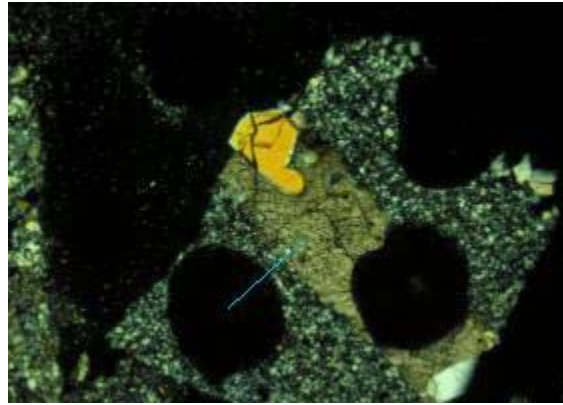
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-28 30-33

#7

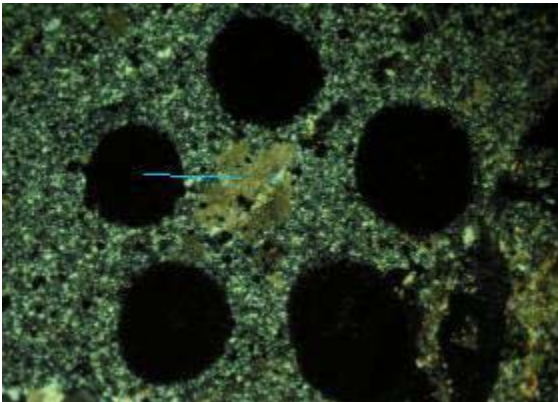
Grains for Carbonate Identification: → (right side of section)



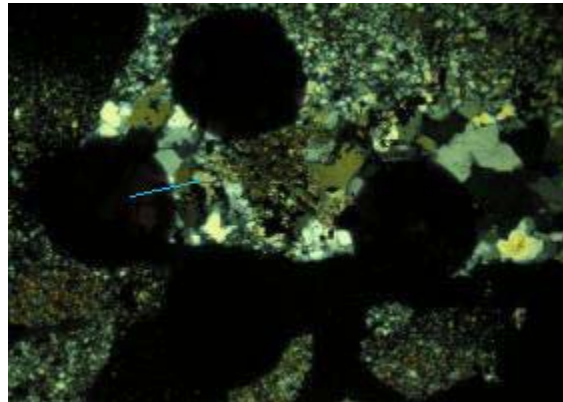
Circle #7 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



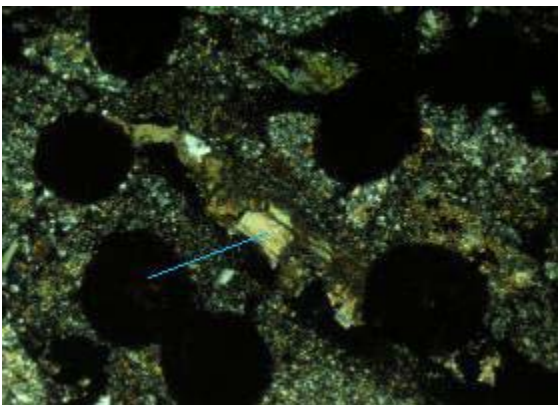
Circle #8 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



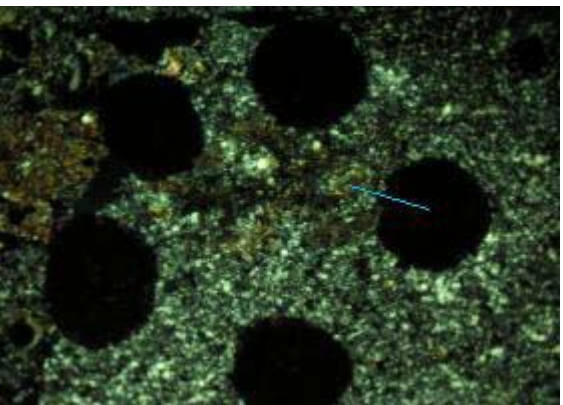
Circle #9 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

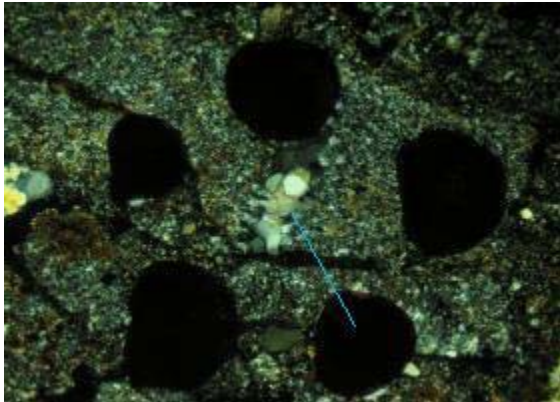


Circle #12 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

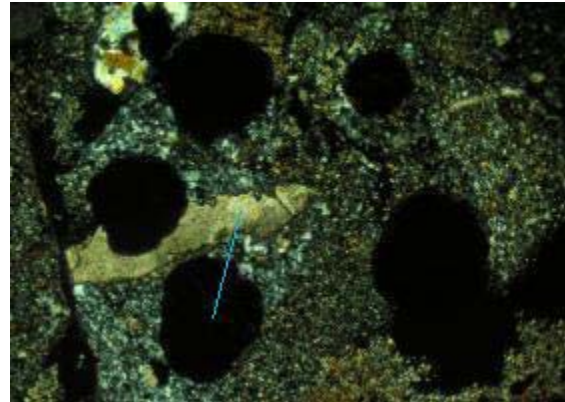
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-28 30-33

#7

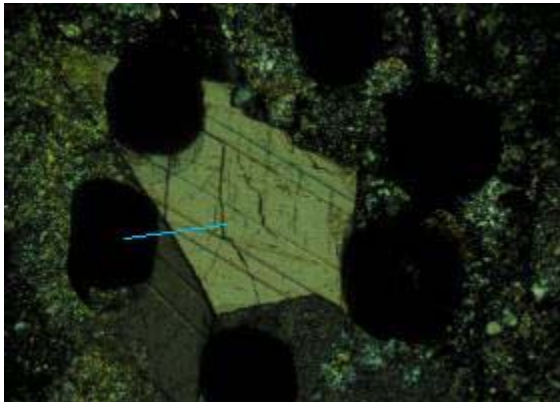
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-02 204-207

#8



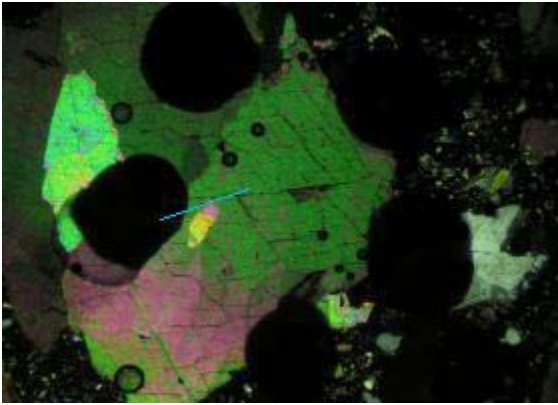
→ (right side of section)

Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

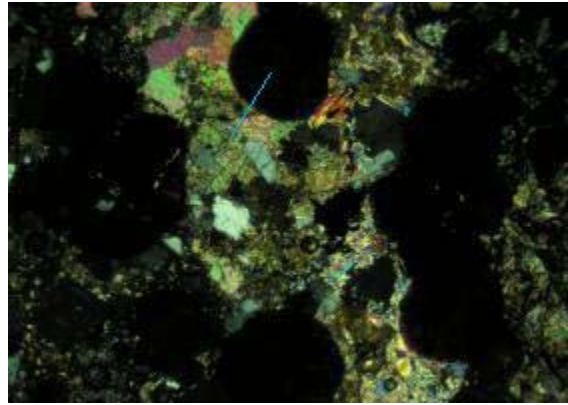
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-02 204-207

#8

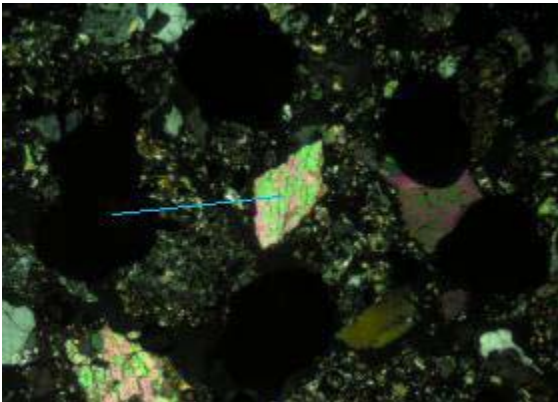
Grains for Carbonate Identification: → (right side of section)



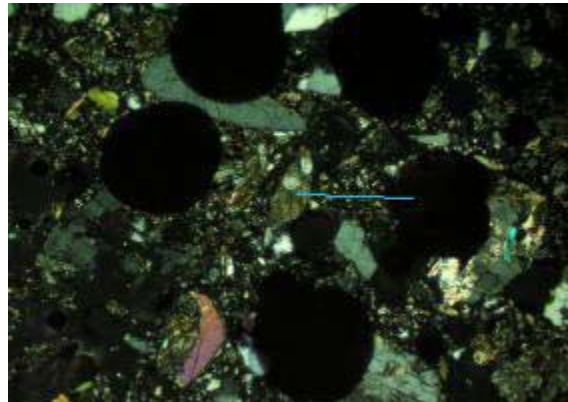
Circle #1 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



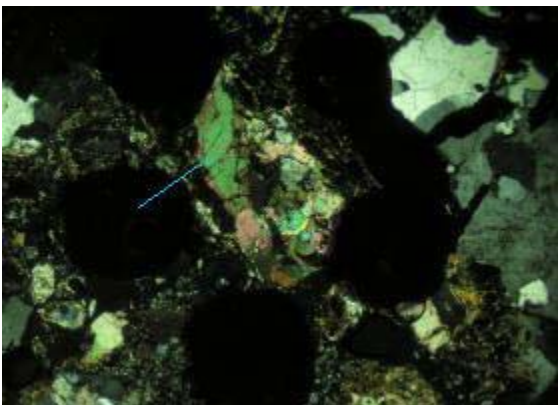
Circle #2 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



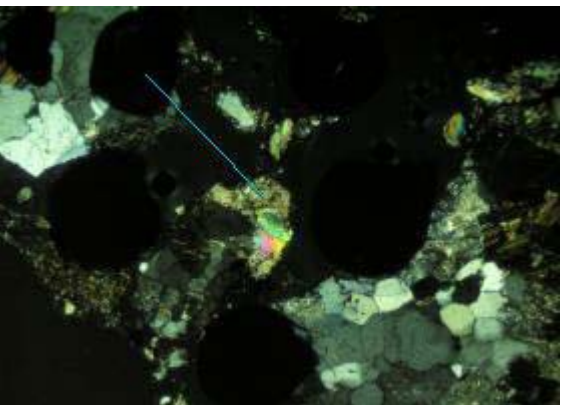
Circle #3 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

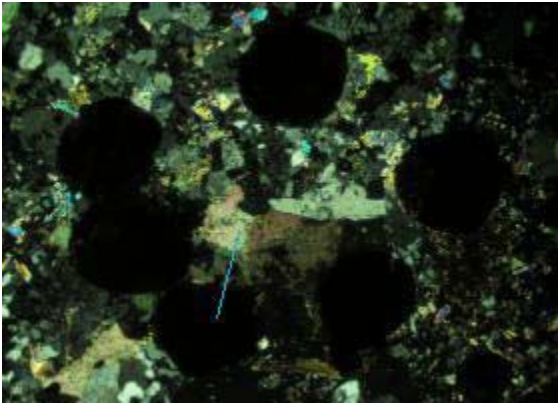


Circle #6 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

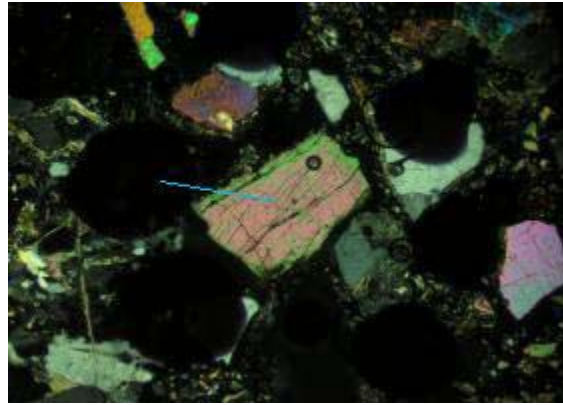
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-02 204-207

#8

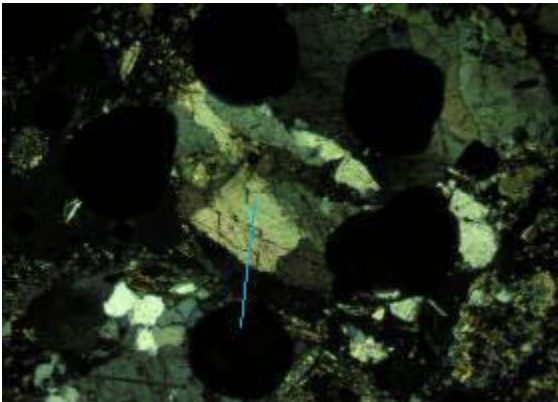
Grains for Carbonate Identification: → (right side of section)



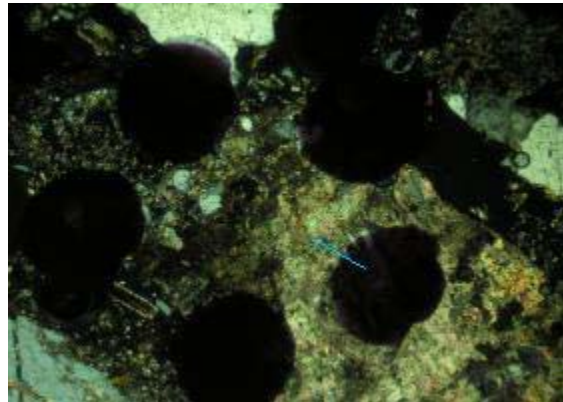
Circle #7 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



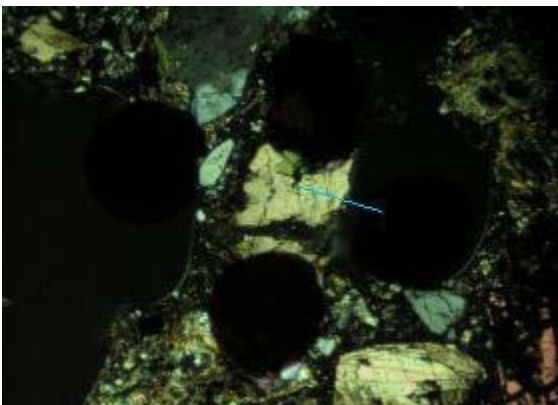
Circle #8 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



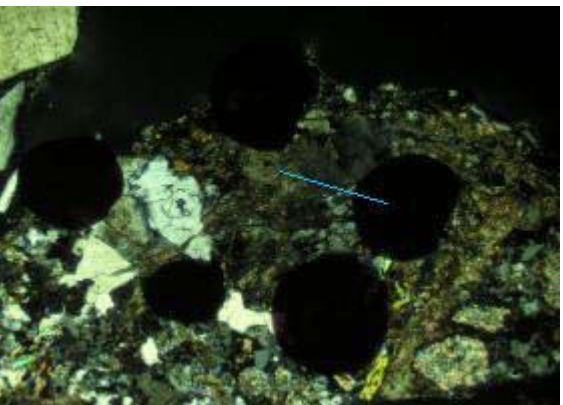
Circle #9 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

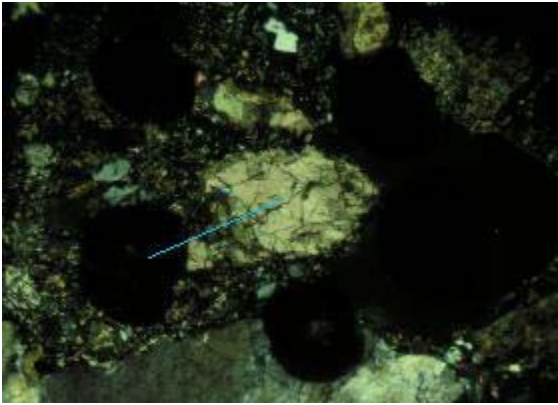


Circle #12 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

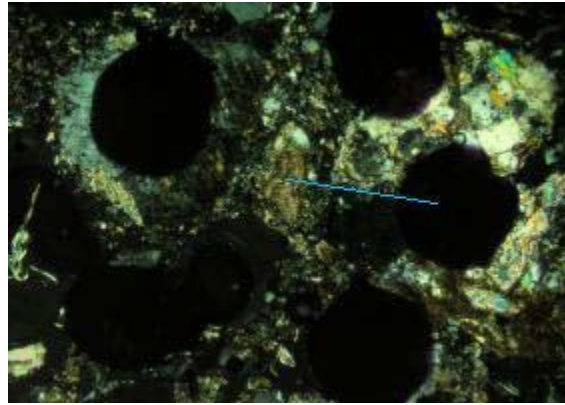
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-02 204-207

#8

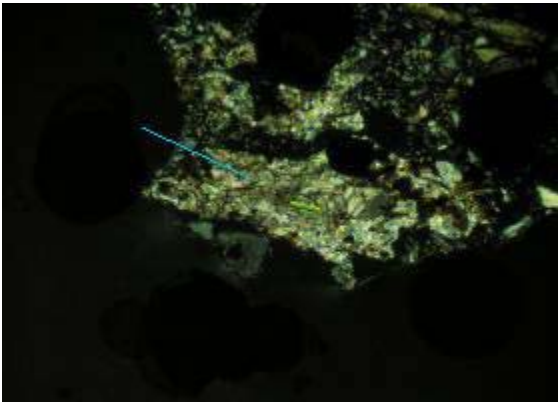
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 69-72

#9



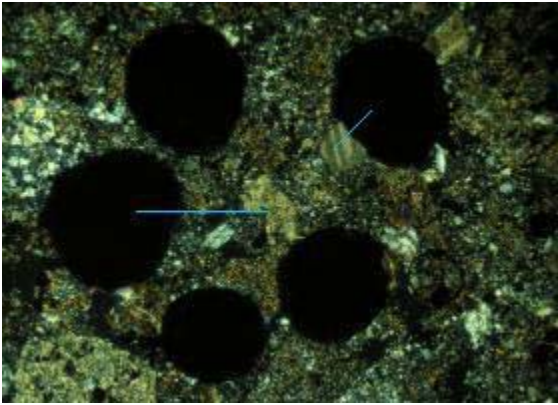
→ (right side of section)

Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

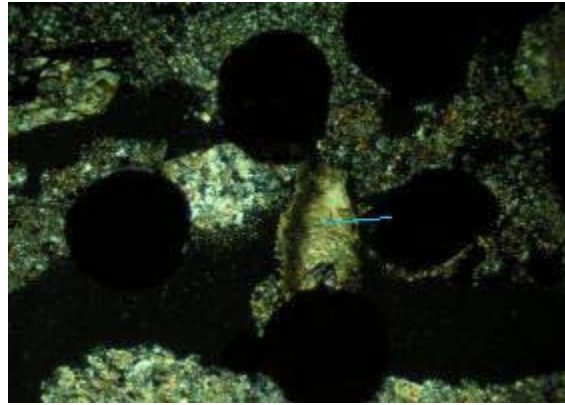
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 69-72

#9

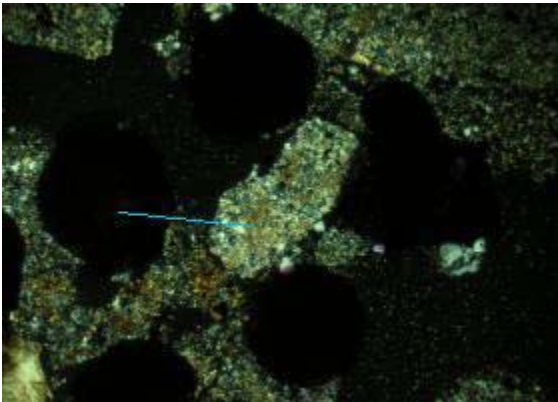
Grains for Carbonate Identification: → (right side of section)



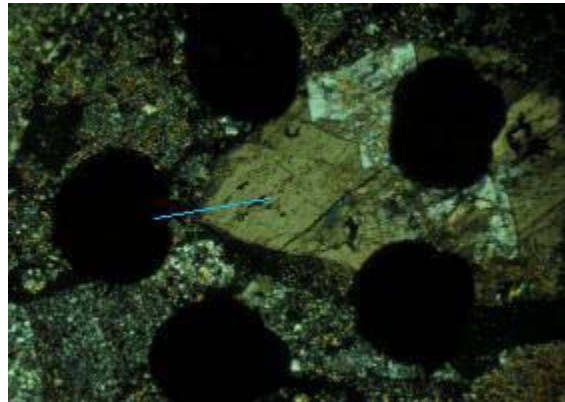
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Blue lines from ink dot to carbonate grains  
→ 2 grains



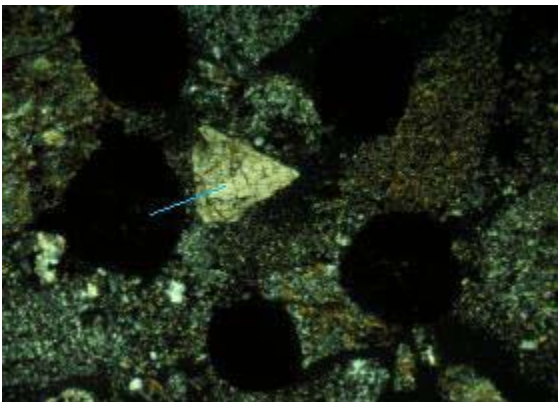
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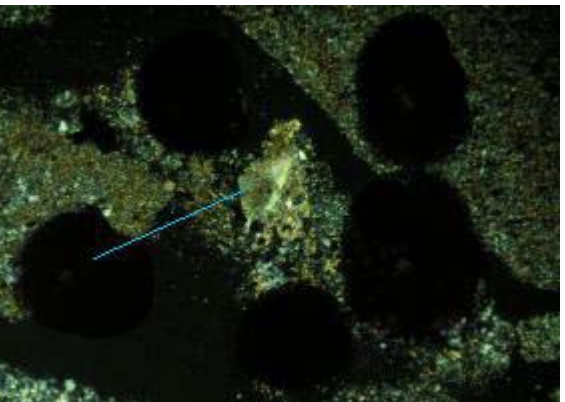
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Blue line from ink dot to carbonate grain



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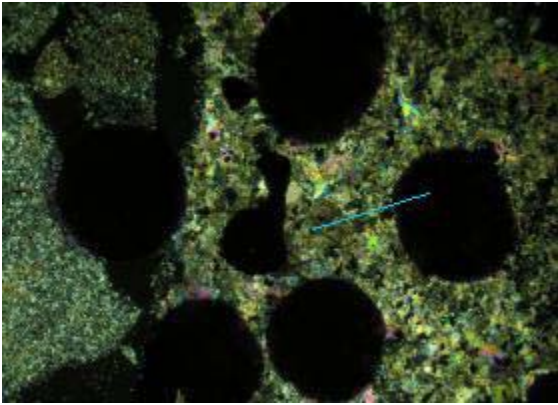


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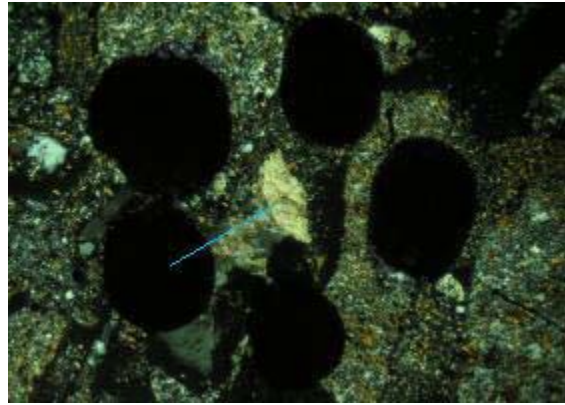
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 69-72

#9

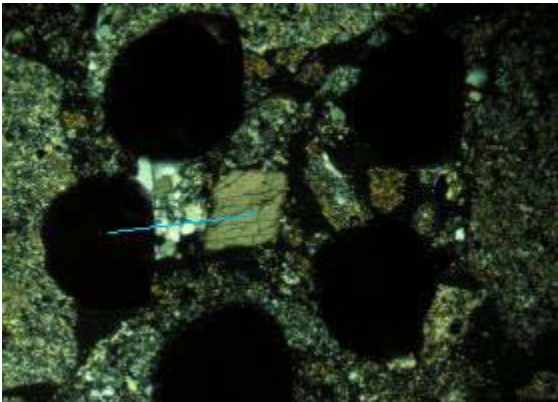
Grains for Carbonate Identification: → (right side of section)



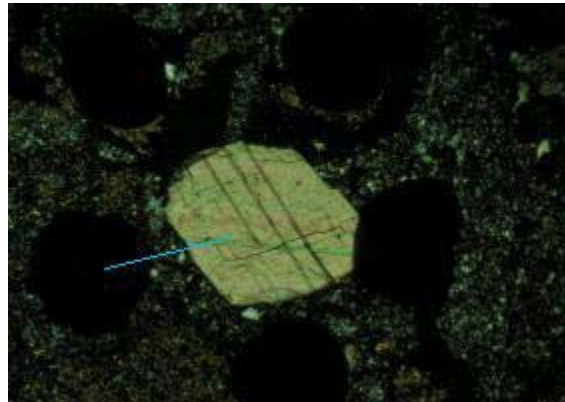
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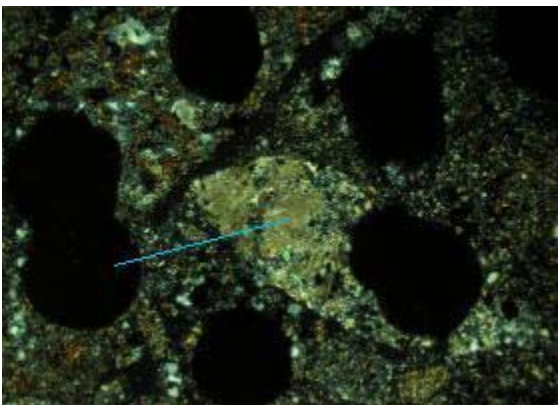
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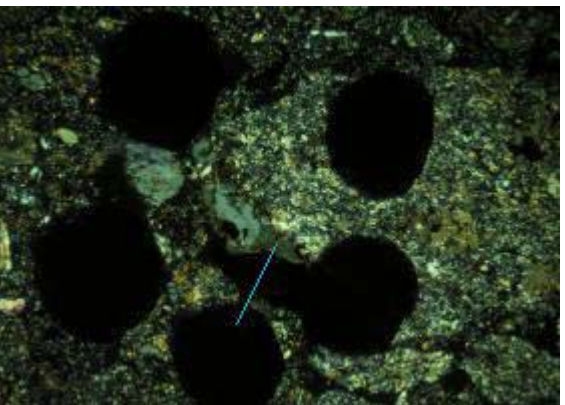
Circle #9 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

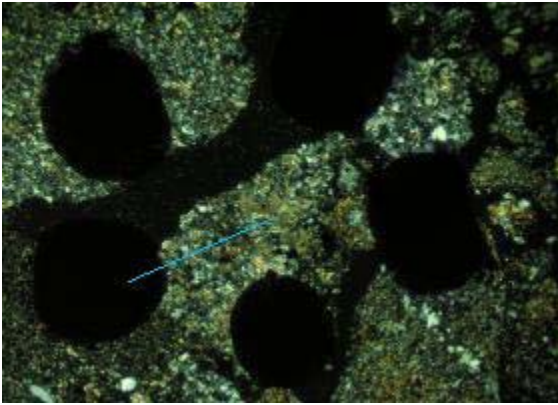


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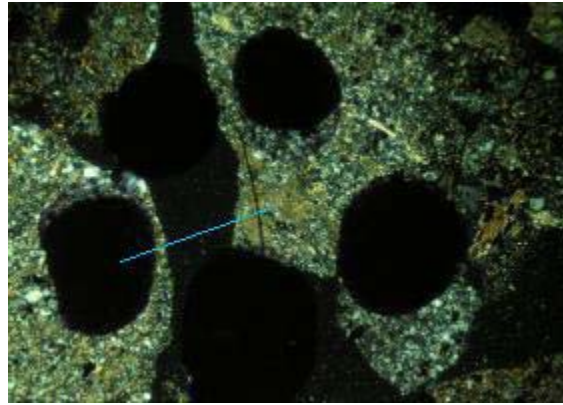
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: K08-09 69-72

#9

Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: Patsy Dump 05

#10



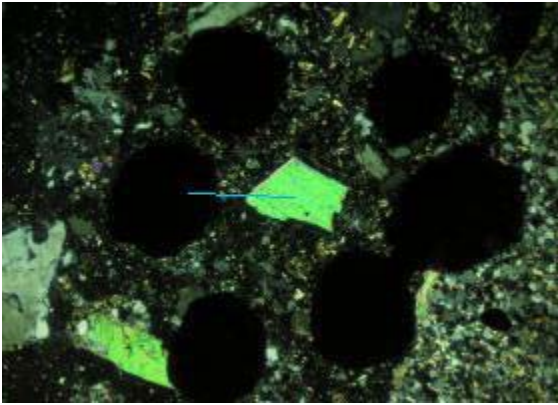
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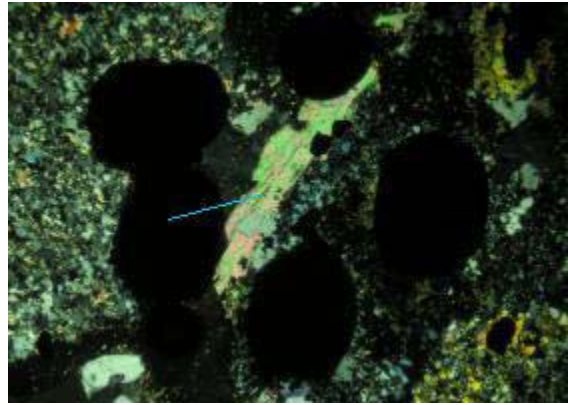
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: Patsy Dump 05

#10

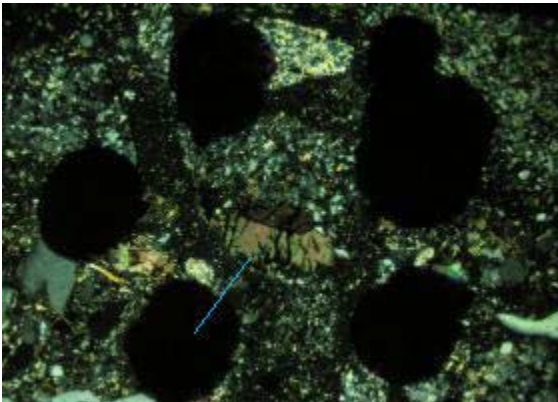
Grains for Carbonate Identification: → (right side of section)



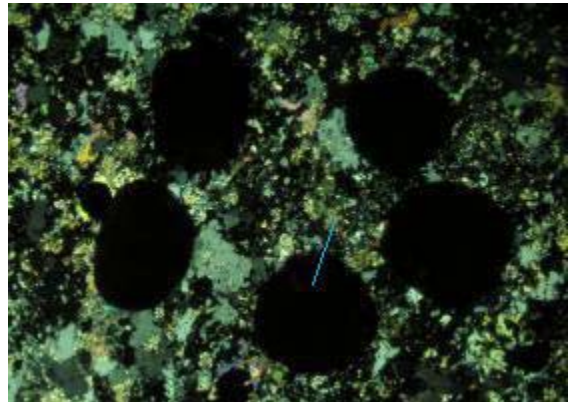
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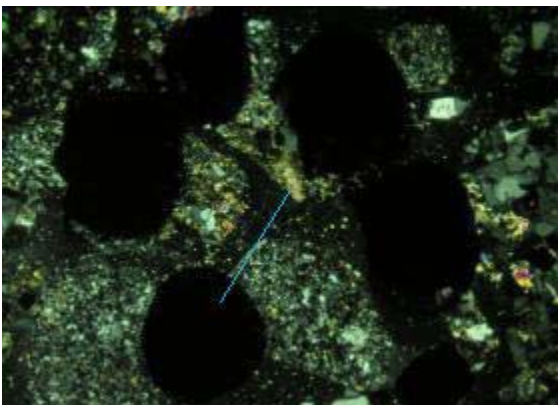
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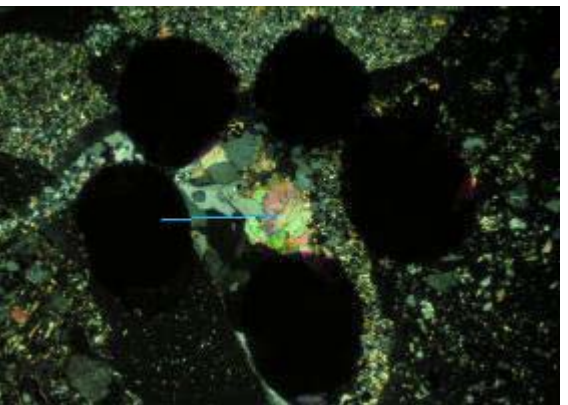
Circle #3 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

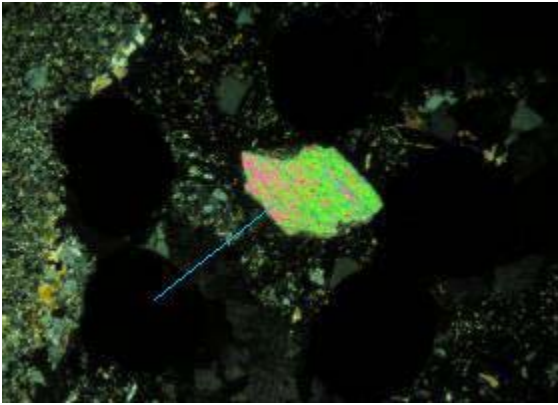


Circle #6 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

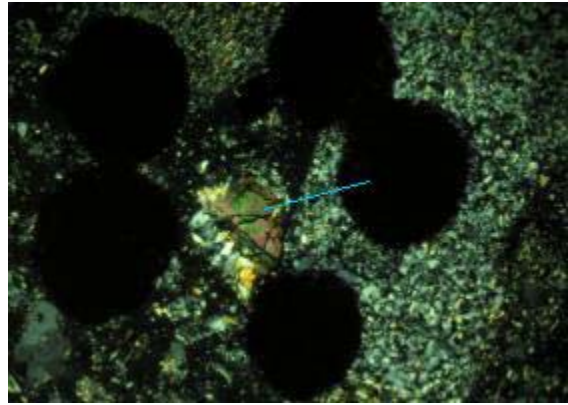
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: Patsy Dump 05

#10

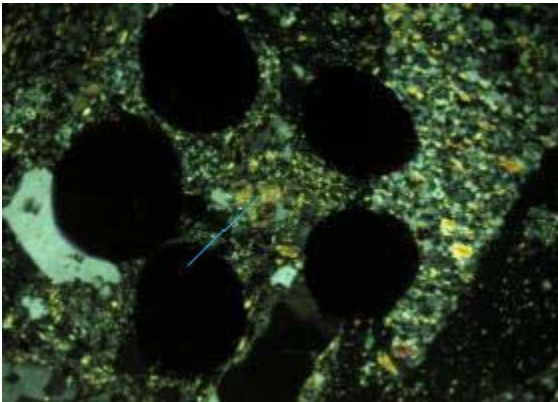
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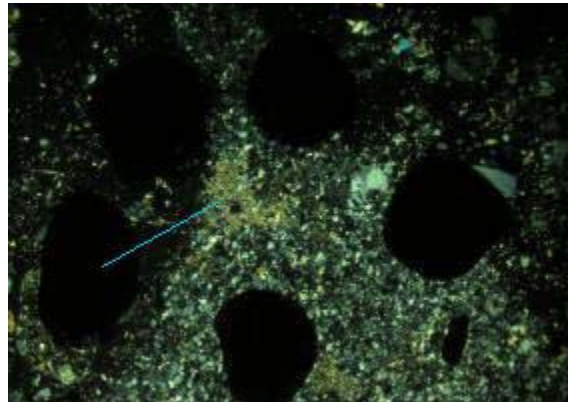
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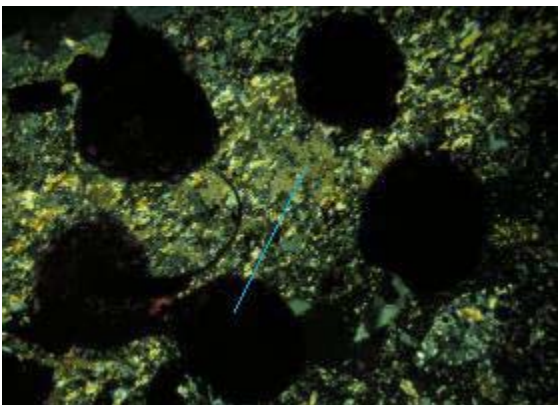
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Blue line from ink dot to carbonate grain



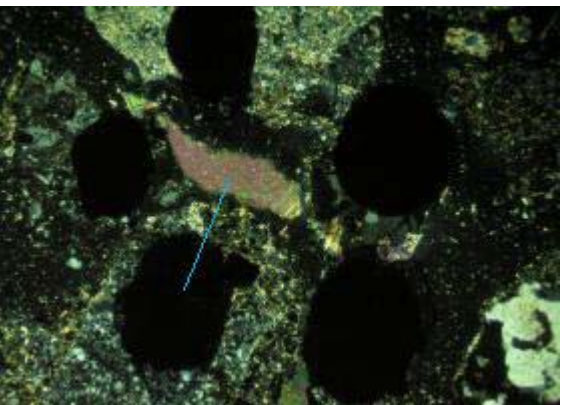
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Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
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Circle #11 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

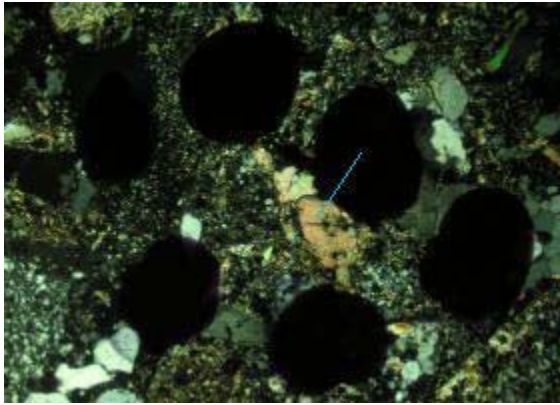


Circle #12 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

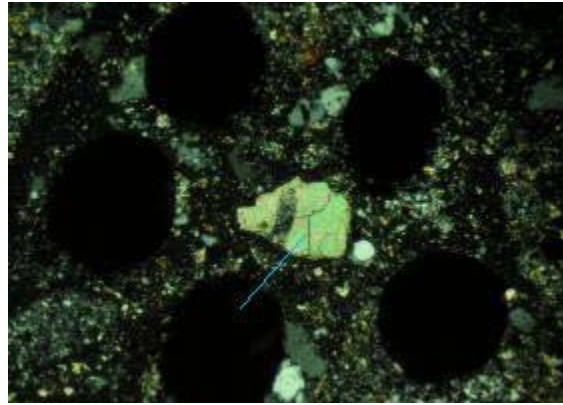
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: Patsy Dump 05

#10

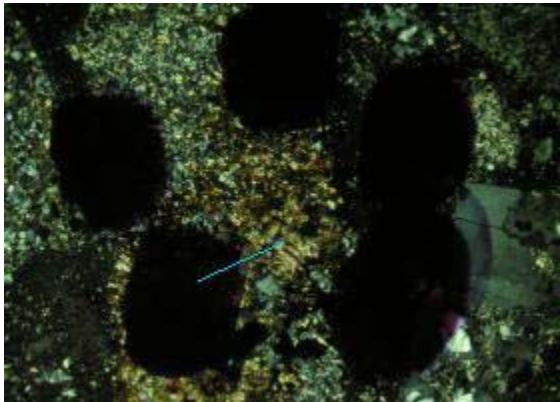
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

SGS CANADA INC. PROJECT #: 0935 Avanti

SAMPLE #: Clary Dump 06 (Note section mislabeled Patsy) #11

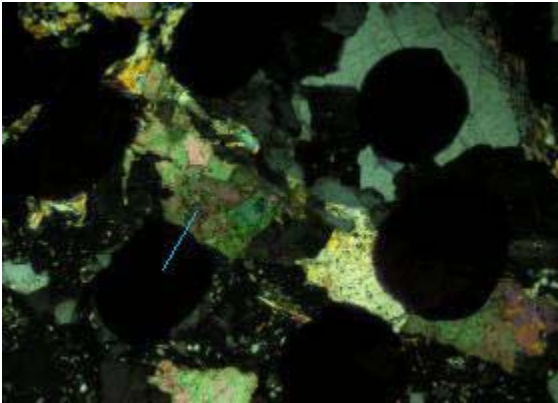


→ (right side of section)

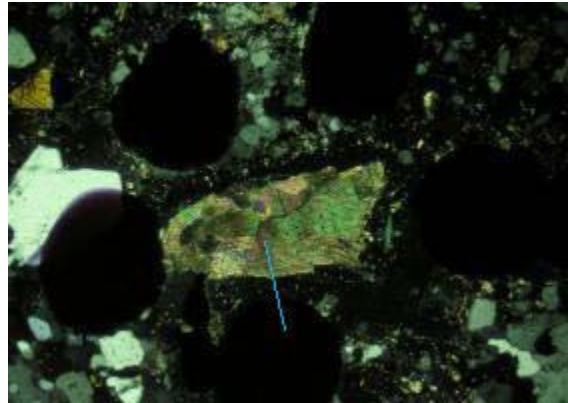
Note: The orientation of detailed circle photos in the following pages is same as image above. The polished thin section identifying number and right edge of above slide is always parallel to the right side of the circle images.

SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: Clary Dump 06

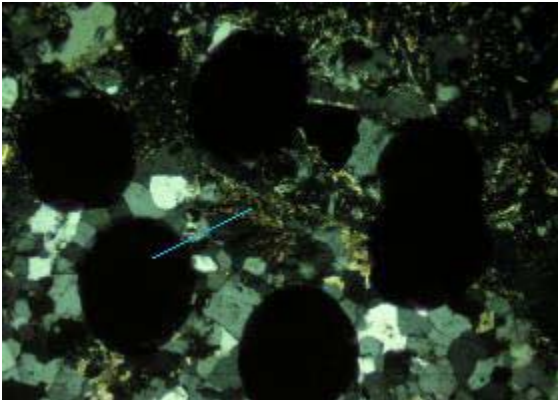
#11



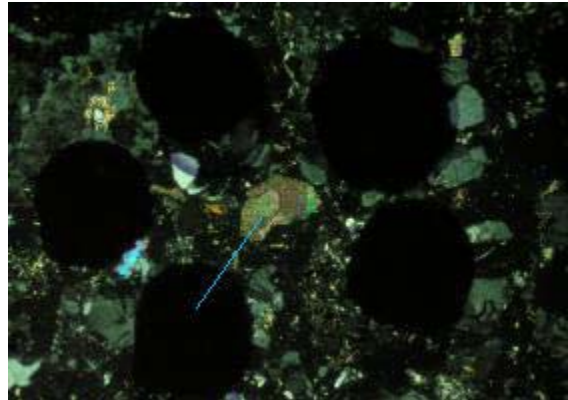
Circle #1 (XPL) FOV = 2.0 mm  
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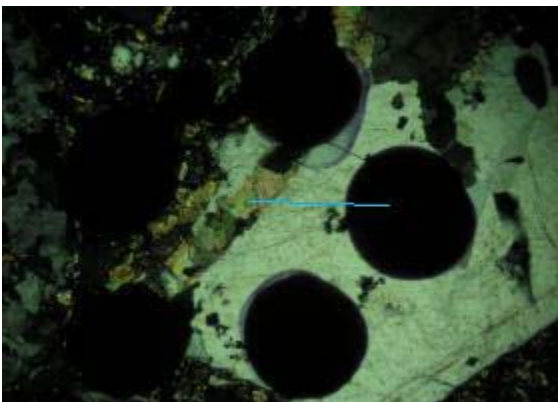
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Blue line from ink dot to carbonate grain



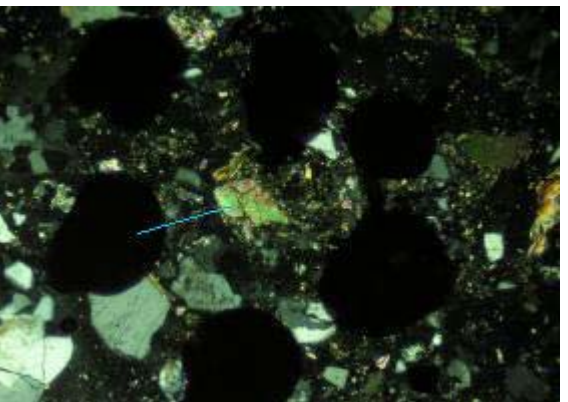
Circle #3 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #4 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #5 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

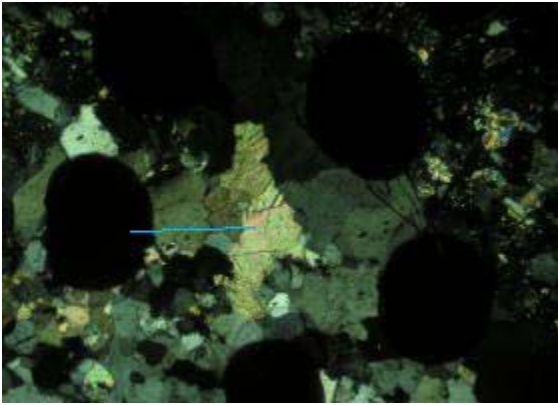


Circle #6 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

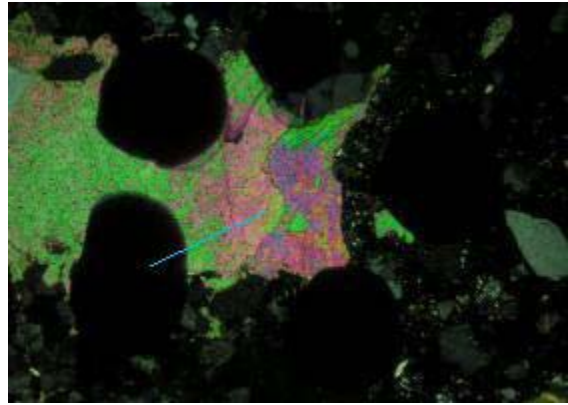
SGS CANADA INC. PROJECT #: 0935 Avanti  
SAMPLE #: Clary Dump 06

#11

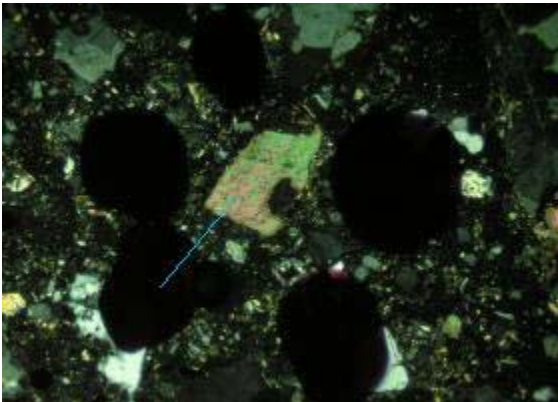
Grains for Carbonate Identification: → (right side of section)



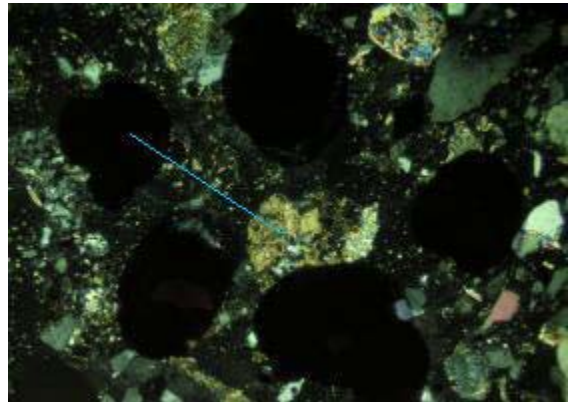
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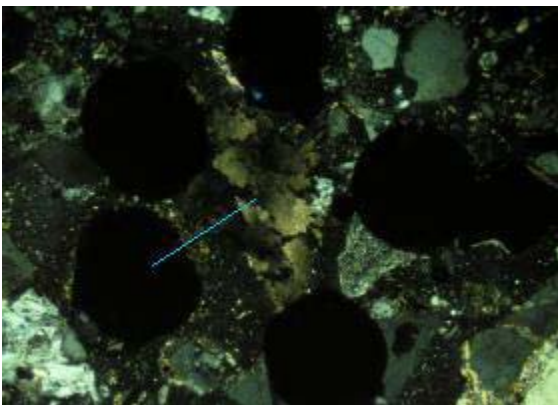
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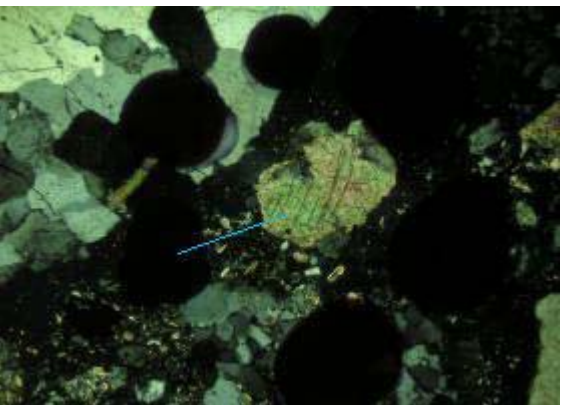
Circle #9 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #10 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



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Blue line from ink dot to carbonate grain

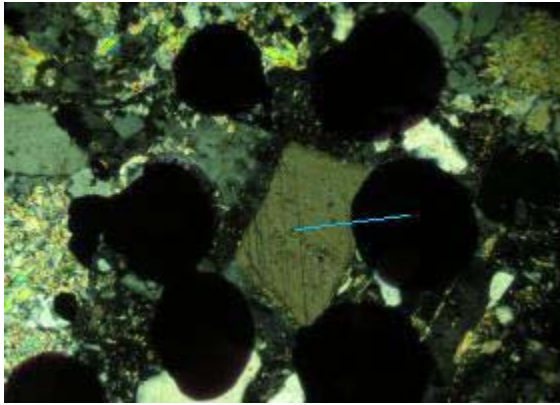


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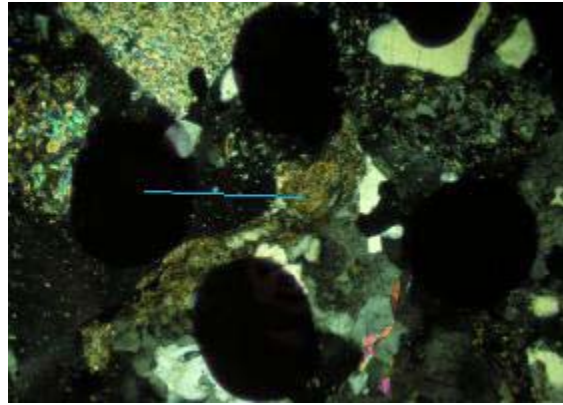
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SAMPLE #: Clary Dump 06

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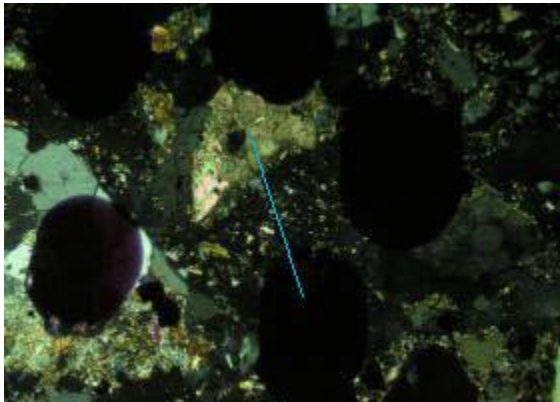
Grains for Carbonate Identification: → (right side of section)



Circle #13 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #14 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain



Circle #15 (XPL) FOV = 2.0 mm  
Blue line from ink dot to carbonate grain

**QUANTITATIVE PHASE ANALYSIS OF 9 POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.**

**(Project: 0935 Avanti Mining – PO# 41994)**

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**Rik Vos  
SGS CEMI Inc.  
6927 Antrim Avenue  
Burnaby, B.C. V5J 4M5**

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**Mati Raudsepp, Ph.D.  
Elisabetta Pani, Ph.D.  
Jenny Lai, B.Sc.**

**Dept. of Earth & Ocean Sciences  
6339 Stores Road  
The University of British Columbia  
Vancouver, BC V6T 1Z4**

**October 23, 2009  
October 26, 2009 REVISED**

## **EXPERIMENTAL METHOD**

The 9 samples of **Project 0935 Avanti Mining** were reduced to the optimum grain-size range for quantitative X-ray analysis (<10  $\mu\text{m}$ ) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Fine grain-size is an important factor in reducing micro-absorption contrast between phases.

Step-scan X-ray powder-diffraction data were collected over a range  $3\text{-}80^\circ 2\theta$  with CoK $\alpha$  radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm ( $0.3^\circ$ ) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of  $6^\circ$ .

## **RESULTS**

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Siemens (Bruker). X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 3 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1 – 9.



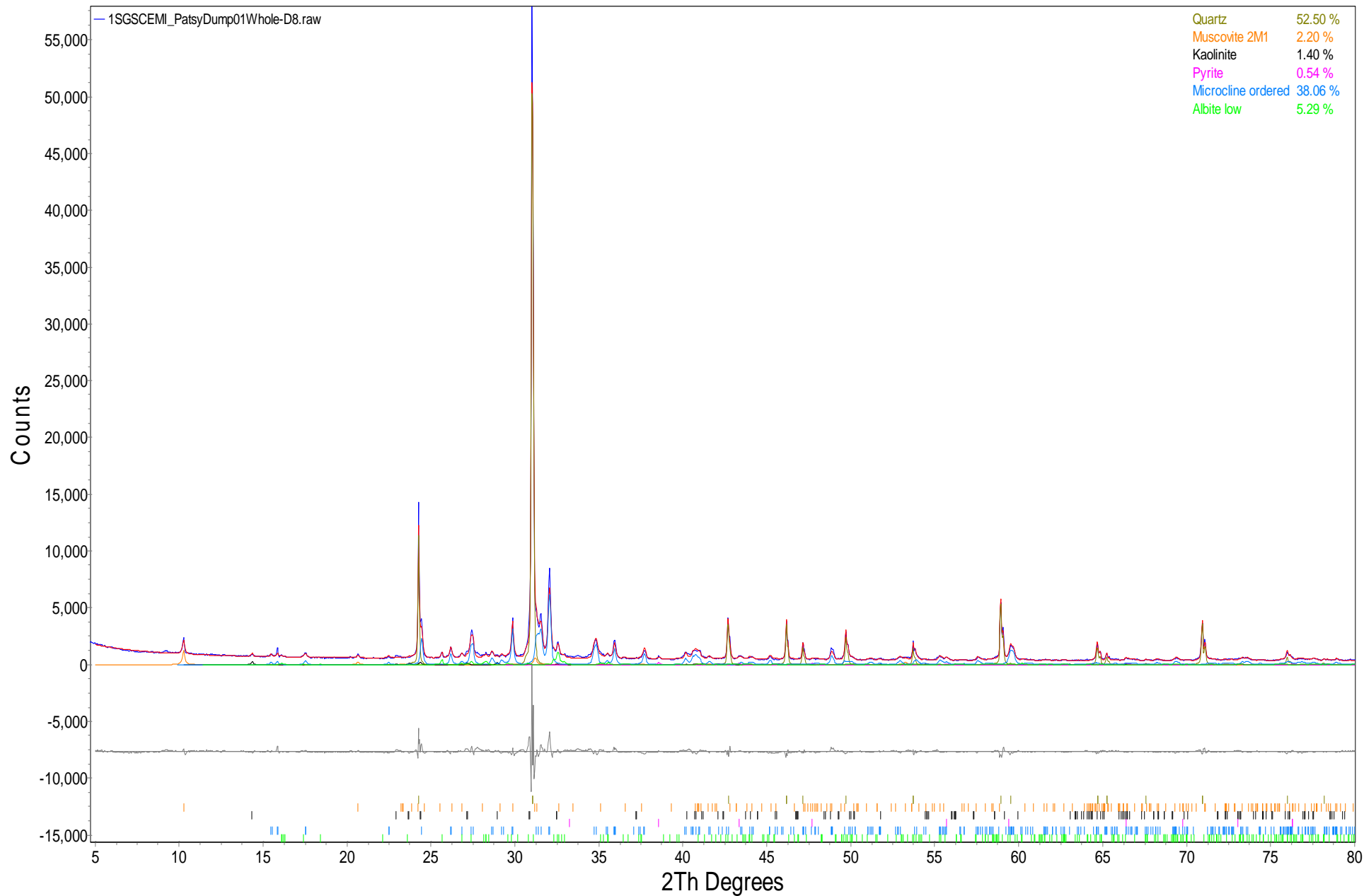


Figure 1. Rietveld refinement plot of sample **SGS CEMI “Patsy Dump 01 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

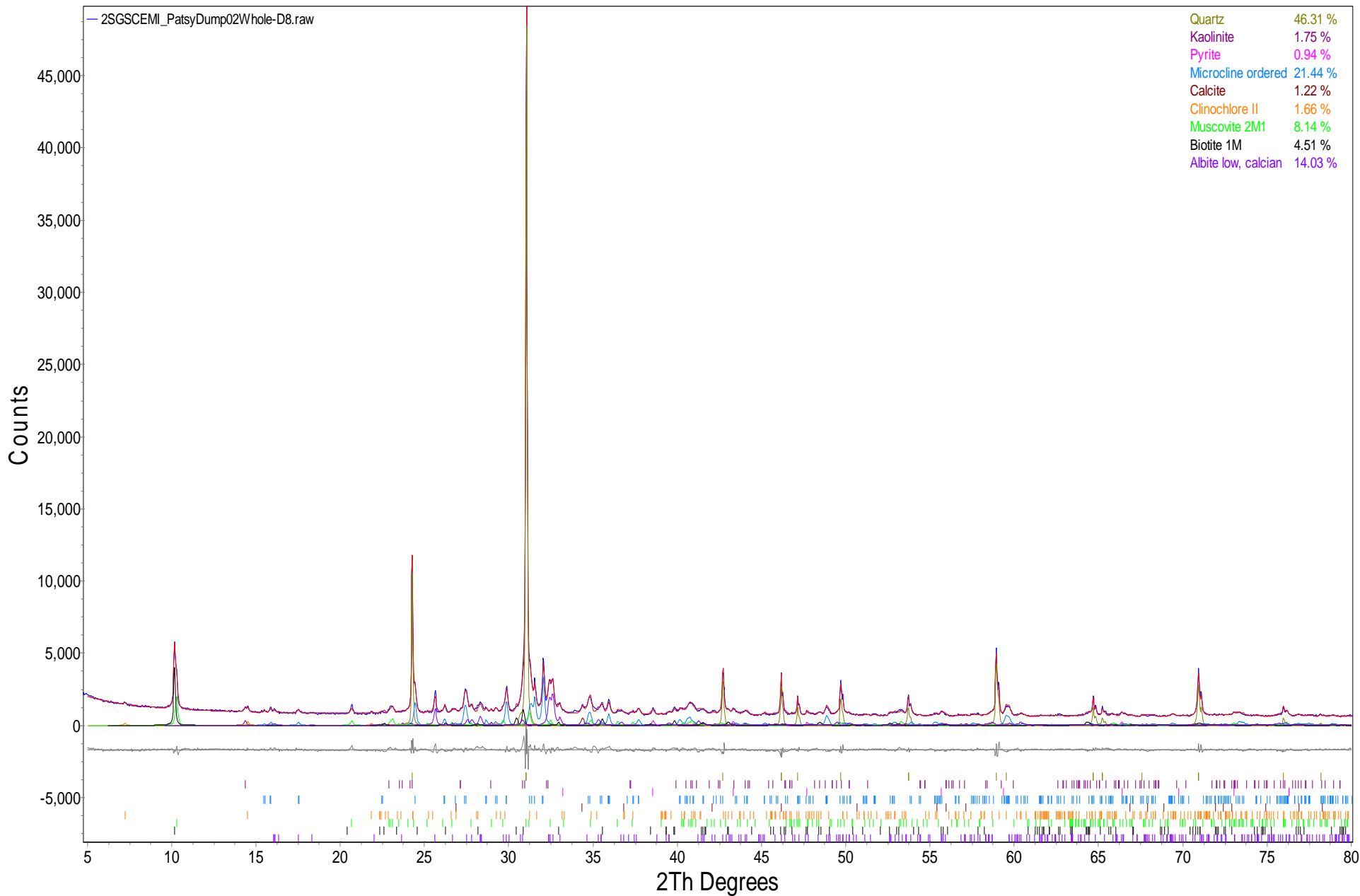


Figure 2. Rietveld refinement plot of sample **SGS CEMI “Patsy Dump 02 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

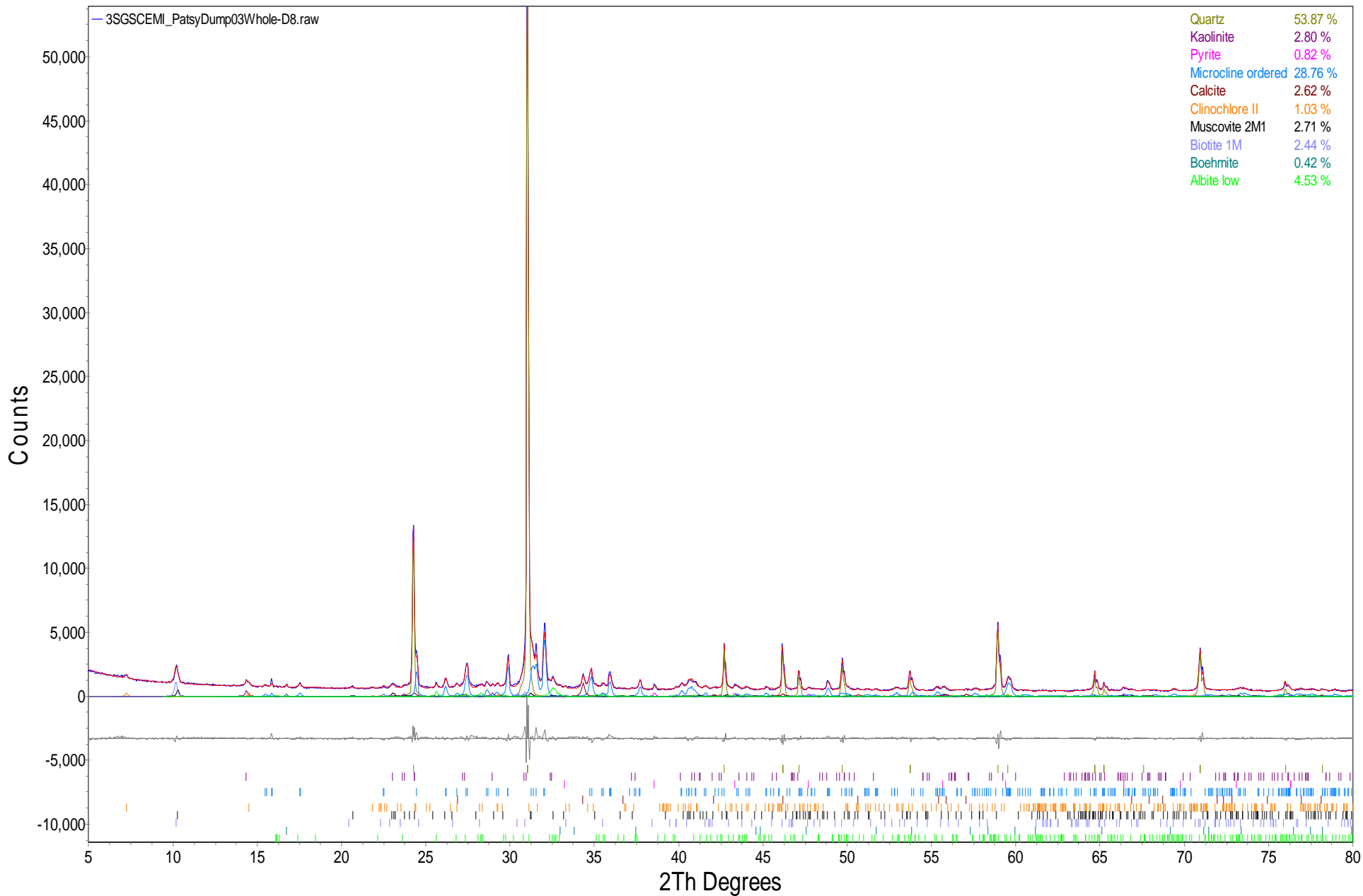


Figure 3. Rietveld refinement plot of sample **SGS CEMI “Patsy Dump 03 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

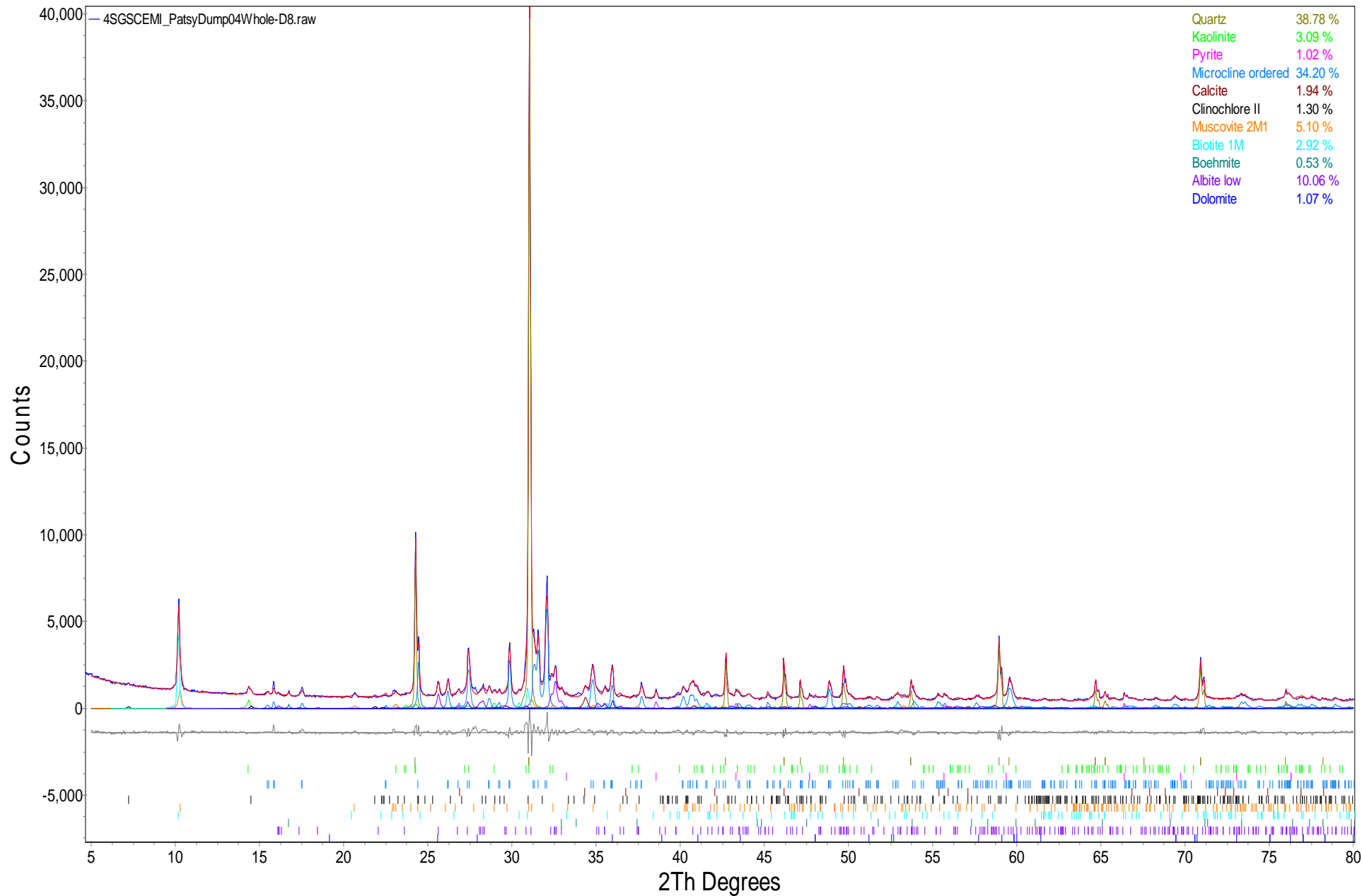


Figure 4. Rietveld refinement plot of sample **SGS CEMI “Patsy Dump 04 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

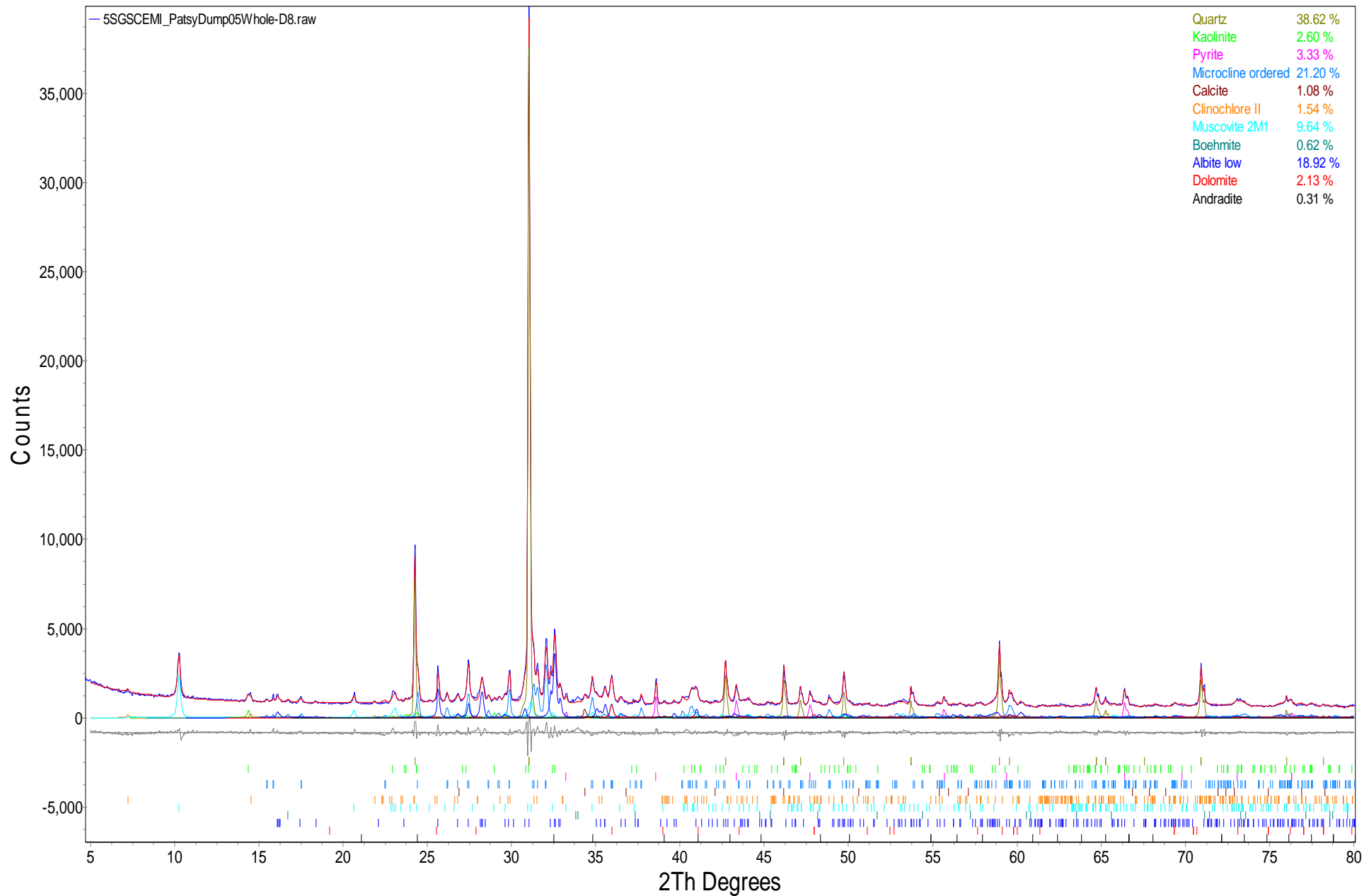


Figure 5. Rietveld refinement plot of sample **SGS CEMI “Patsy Dump 05 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

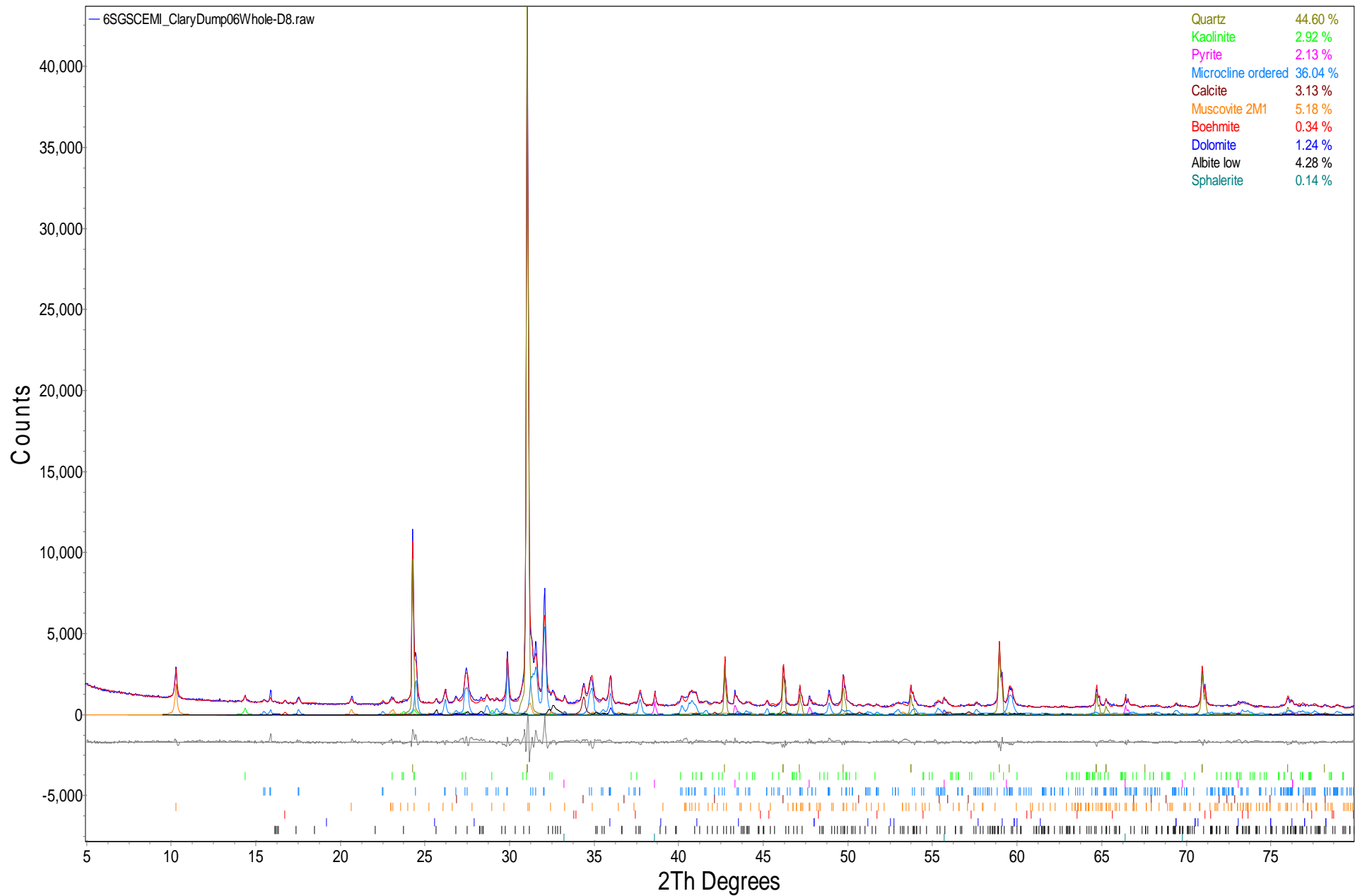


Figure 6. Rietveld refinement plot of sample **SGS CEMI “Clary Dump 06 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

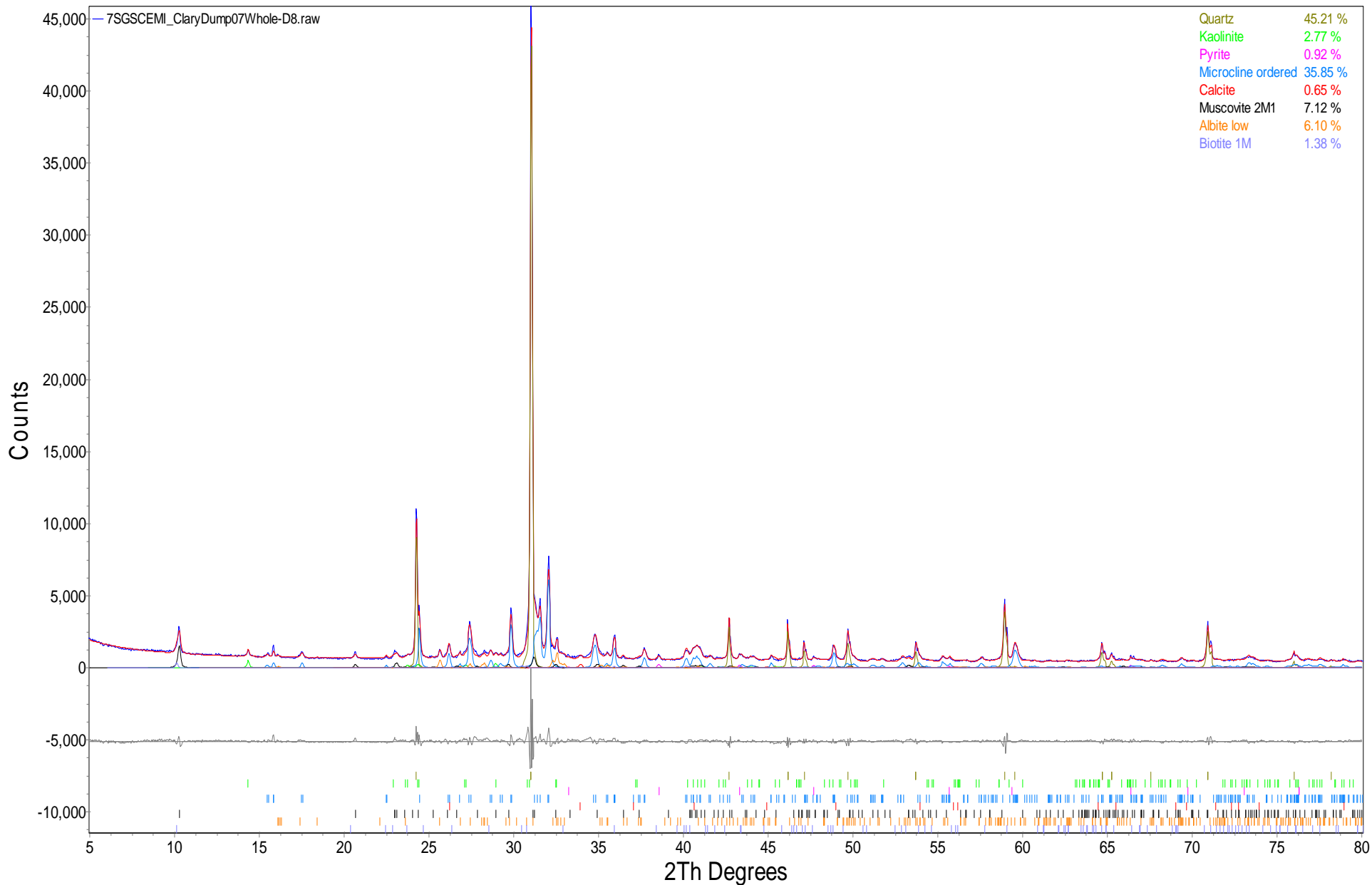


Figure 7. Rietveld refinement plot of sample **SGS CEMI “Clary Dump 07 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

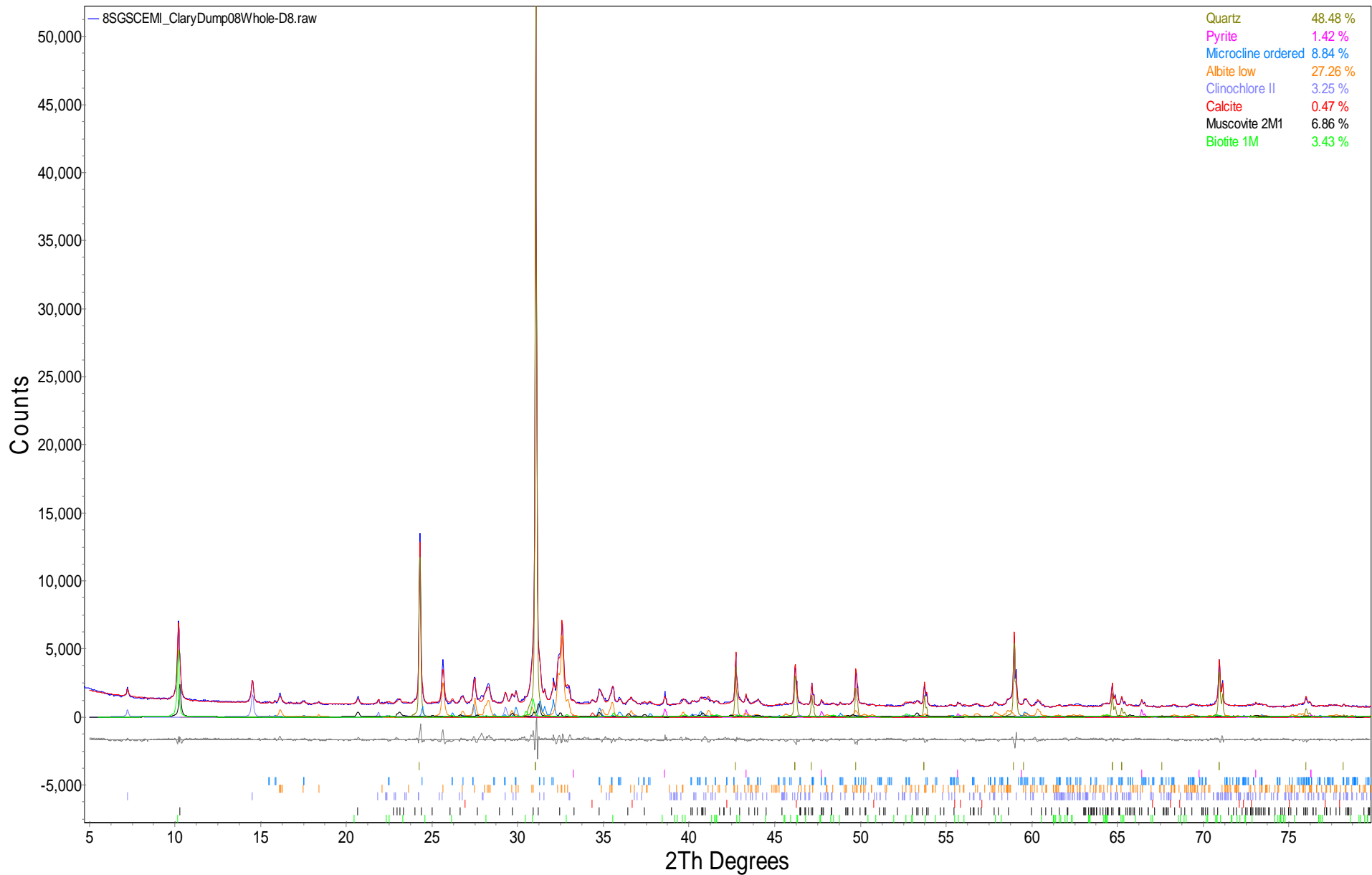


Figure 8. Rietveld refinement plot of sample **SGS CEMI “Clary Dump 08 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

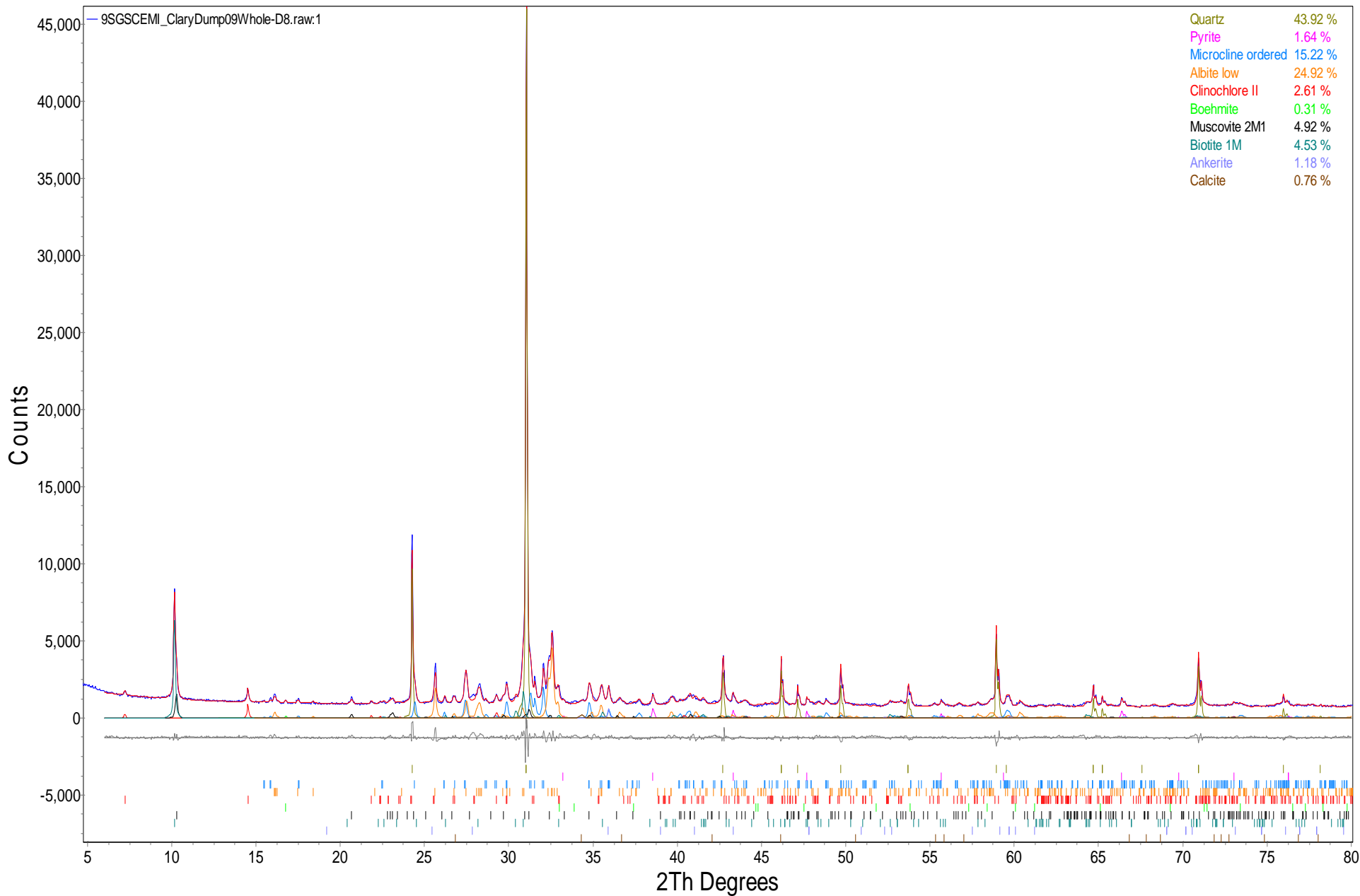


Figure 9. Rietveld refinement plot of sample **SGS CEMI “Clary Dump 09 Whole”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

**QUANTITATIVE PHASE ANALYSIS OF 25 POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.**

*(Project: 0935 Avanti Mining – PO# 42037)*

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***Rik Vos  
SGS CEMI Inc.  
6927 Antrim Avenue  
Burnaby, B.C. V5J 4M5***

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***Mati Raudsepp, Ph.D.  
Elisabetta Pani, Ph.D.  
Jenny Lai, B.Sc.***

***Dept. of Earth & Ocean Sciences  
6339 Stores Road  
The University of British Columbia  
Vancouver, BC V6T 1Z4***

***January 18, 2010***

## EXPERIMENTAL METHOD

The 25 samples of **Project 0935 Avanti Mining** were reduced to the optimum grain-size range for quantitative X-ray analysis (<10  $\mu\text{m}$ ) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Fine grain-size is an important factor in reducing micro-absorption contrast between phases.

Step-scan X-ray powder-diffraction data were collected over a range  $3\text{-}80^{\circ}2\theta$  with CoK $\alpha$  radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm ( $0.3^{\circ}$ ) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of  $6^{\circ}$ .

## RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Siemens (Bruker). X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 3 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1 (separate file, *SGS CEMI Results Jan 18 2010 – Proj Avanti Mining.xls*). These amounts represent the relative amounts of crystalline phases normalized to 100%. Ideal formulae for the minerals are given in Table 2. The Rietveld refinement plots are shown in Figures 1 – 25.

Table 2.

Mineral	Ideal Formula
Actinolite	$\text{Ca}_2(\text{Mg}, \text{Fe}^{2+})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$
Anatase	$\text{TiO}_2$
Anhydrite	$\text{CaSO}_4$
Ankerite/Dolomite	$\text{Ca}(\text{Fe}^{2+}, \text{Mg}, \text{Mn})(\text{CO}_3)_2/\text{CaMg}(\text{CO}_3)_2$
Biotite	$\text{K}(\text{Mg}, \text{Fe}^{2+})_3\text{AlSi}_3\text{O}_{10}(\text{OH})_2$
Calcite	$\text{CaCO}_3$
Clinocllore	$(\text{Mg}, \text{Fe}^{2+})_5\text{Al}(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_8$
Gypsum	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Kaolinite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$
K-feldspar	$\text{KAlSi}_3\text{O}_8$
Lepidocrocite	$\gamma\text{-Fe}^{3+}\text{O}(\text{OH})$
Magnetite	$\text{Fe}_3\text{O}_4$
Molybdenite	$\text{MoS}_2$
Montmorillonite Model	$(\text{Na}, \text{Ca})_{0.3}(\text{Al}, \text{Mg})_2\text{Si}_4\text{O}_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$
Muscovite	$\text{KAl}_2\text{AlSi}_3\text{O}_{10}(\text{OH})_2$
Plagioclase	$\text{NaAlSi}_3\text{O}_8 - \text{CaAl}_2\text{Si}_2\text{O}_8$
Pseudorutile	$\text{Fe}_2^{3+}\text{Ti}_3\text{O}_9$
Pyrite	$\text{FeS}_2$
Pyrrhotite	$\text{Fe}_{1-x}\text{S}$
Quartz	$\text{SiO}_2$
Siderite	$\text{Fe}^{2+}\text{CO}_3$
Sphalerite	$(\text{Zn}, \text{Fe})\text{S}$

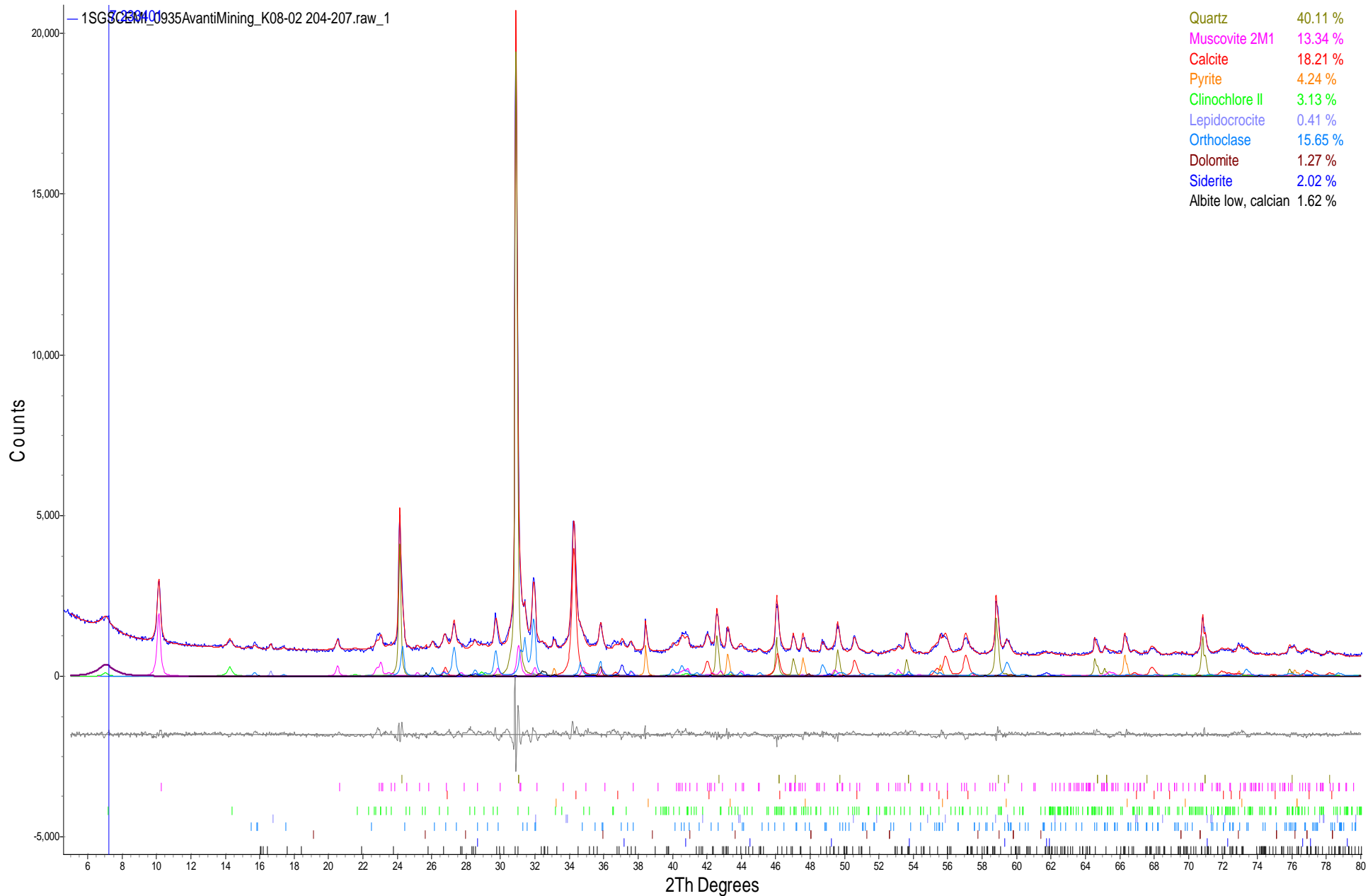


Figure 1. Rietveld refinement plot of sample **SGS CEMI “K08-02 204-207”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

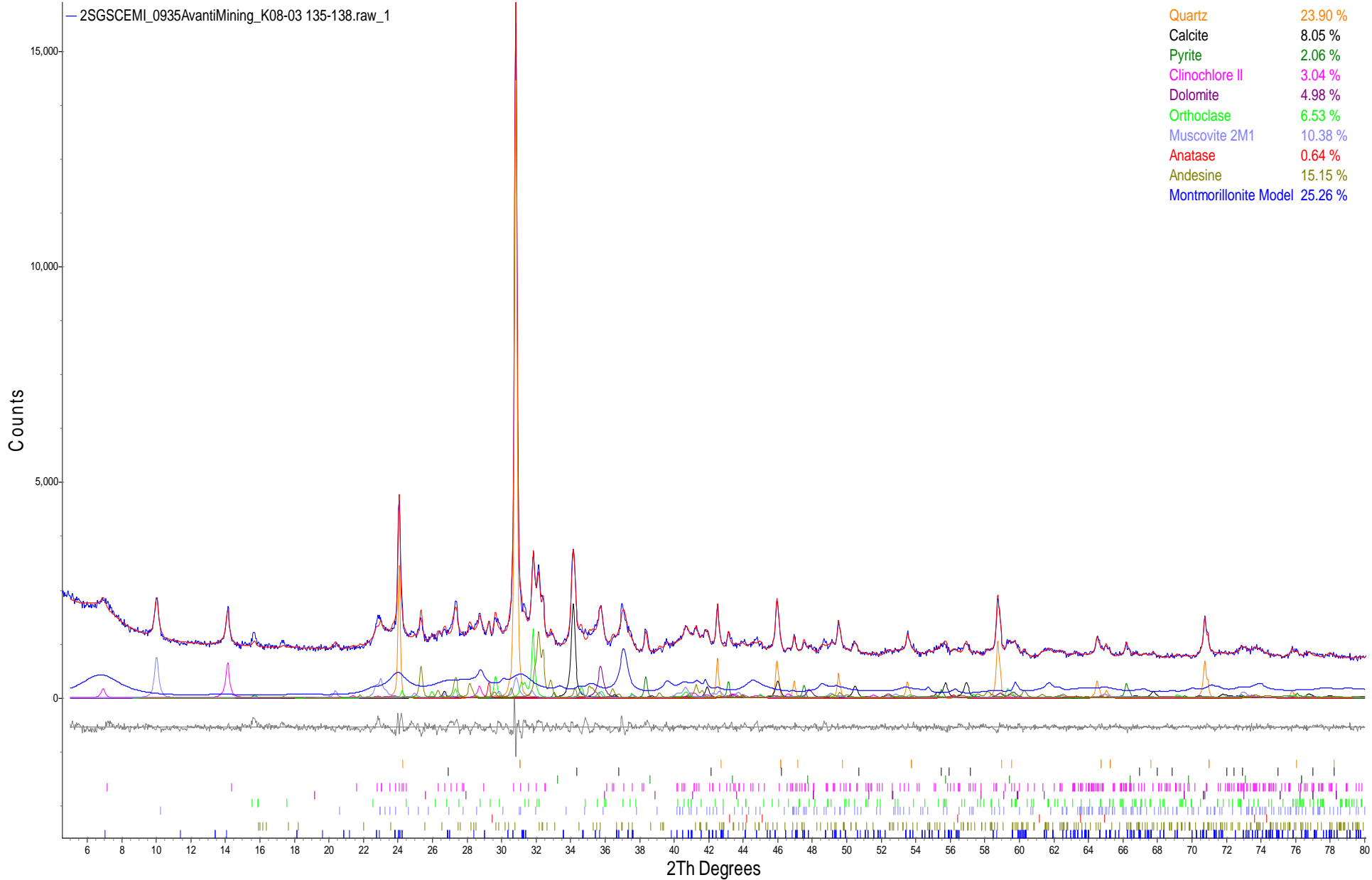


Figure 2. Rietveld refinement plot of sample **SGS CEMI “K08-03 135-138”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

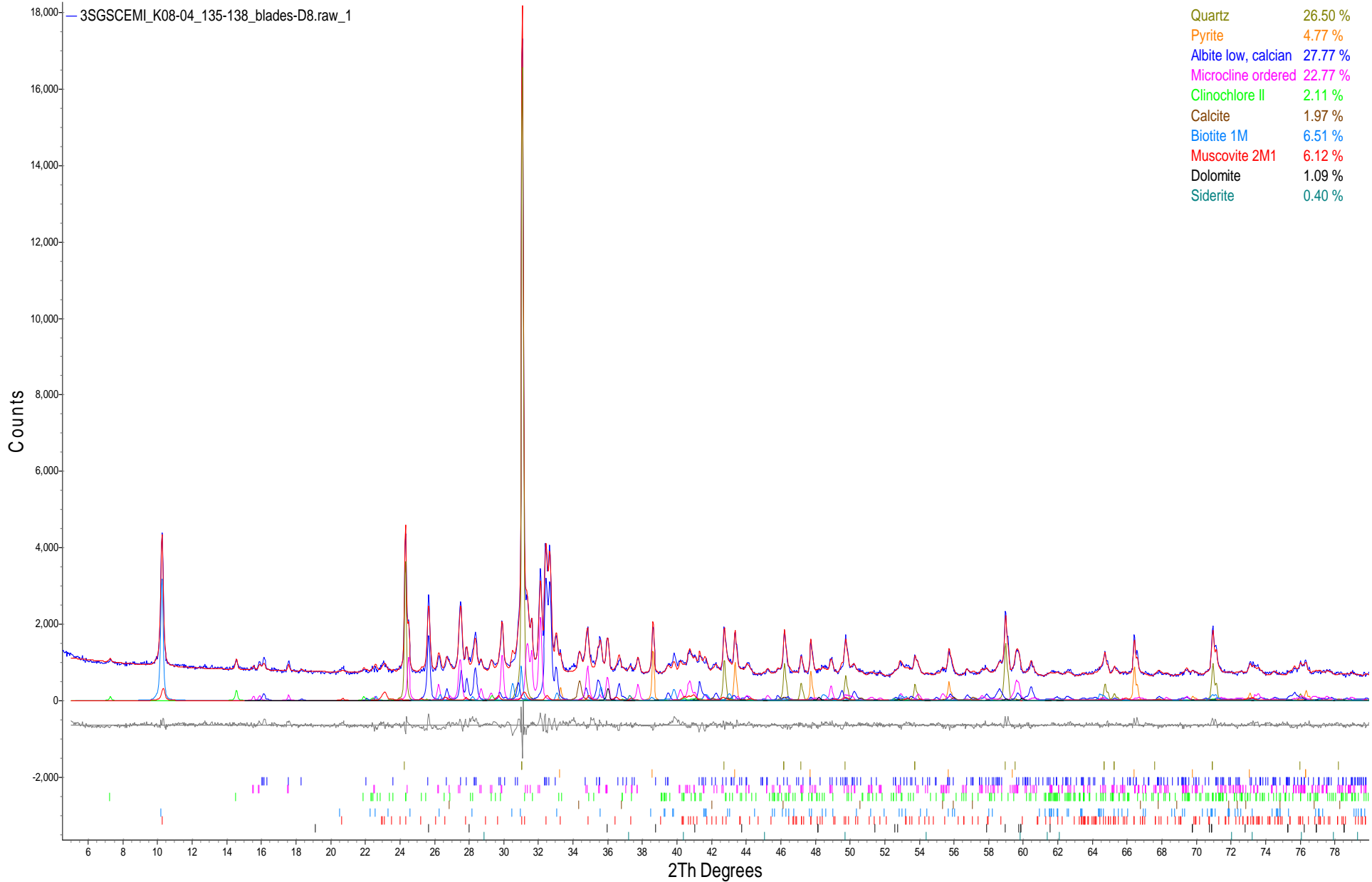


Figure 3. Rietveld refinement plot of sample **SGS CEMI “K08-04 135-138”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

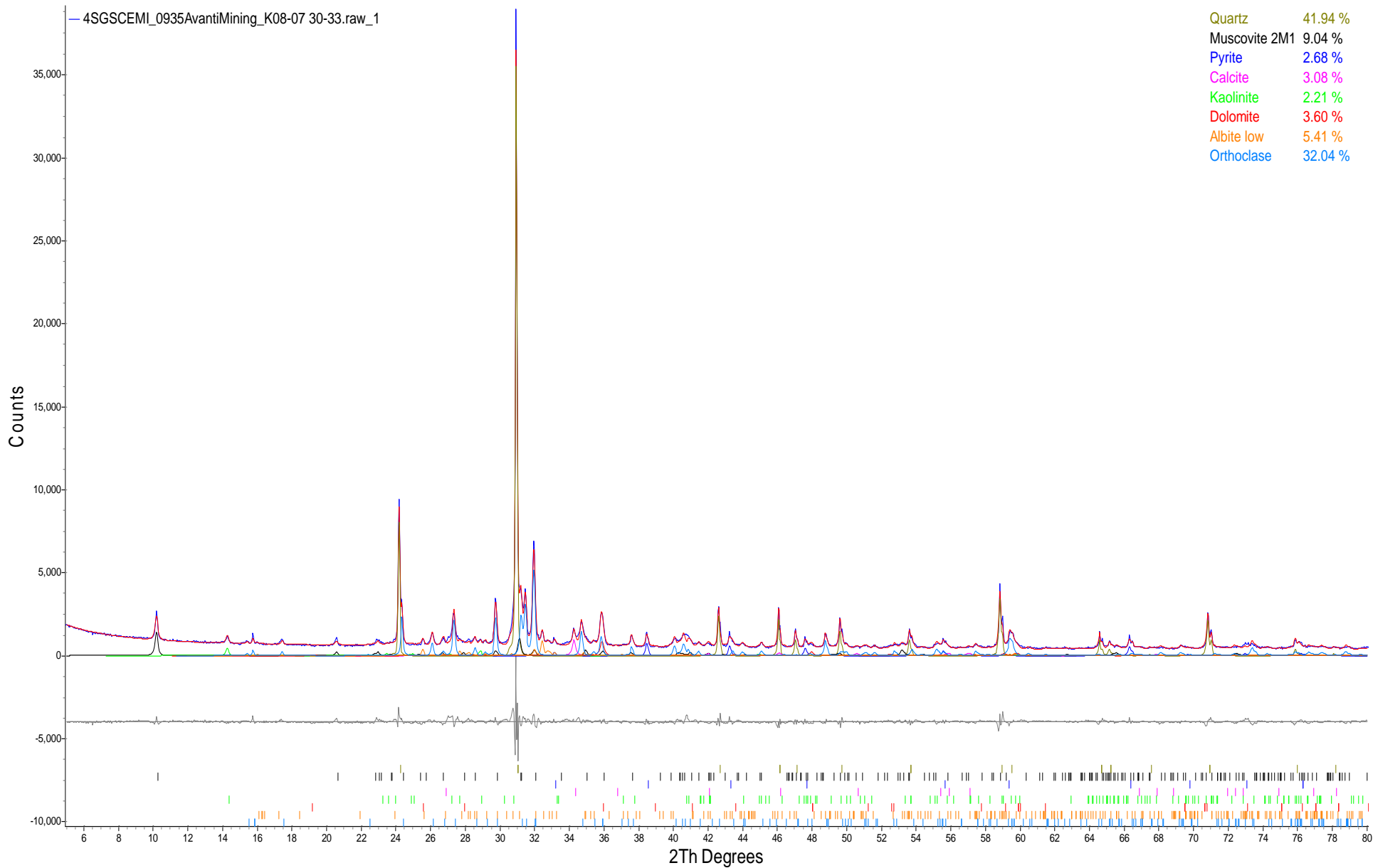


Figure 4. Rietveld refinement plot of sample **SGS CEMI “K08-07 30-33”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

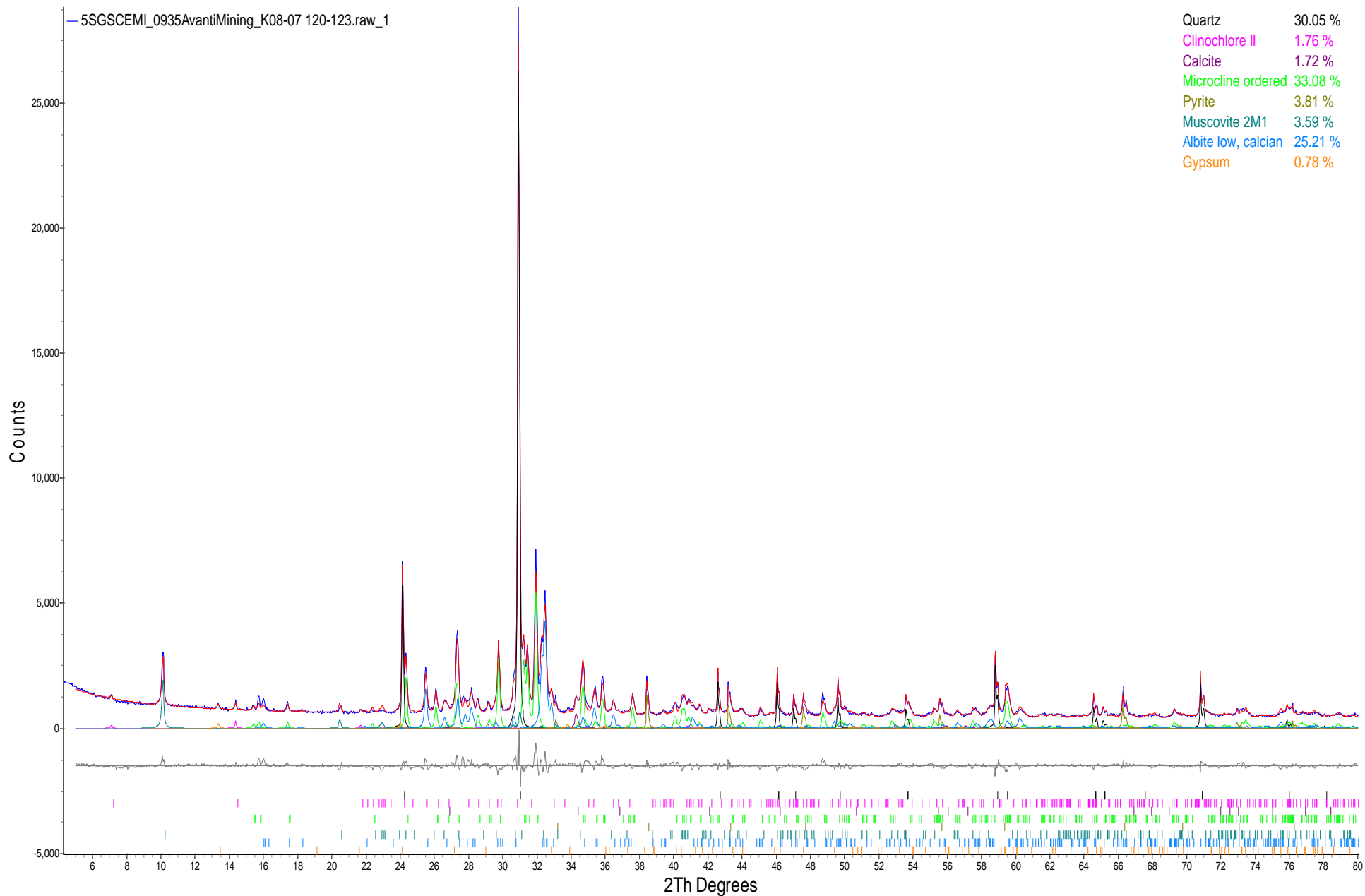


Figure 5. Rietveld refinement plot of sample **SGS CEMI “K08-07 120-123”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

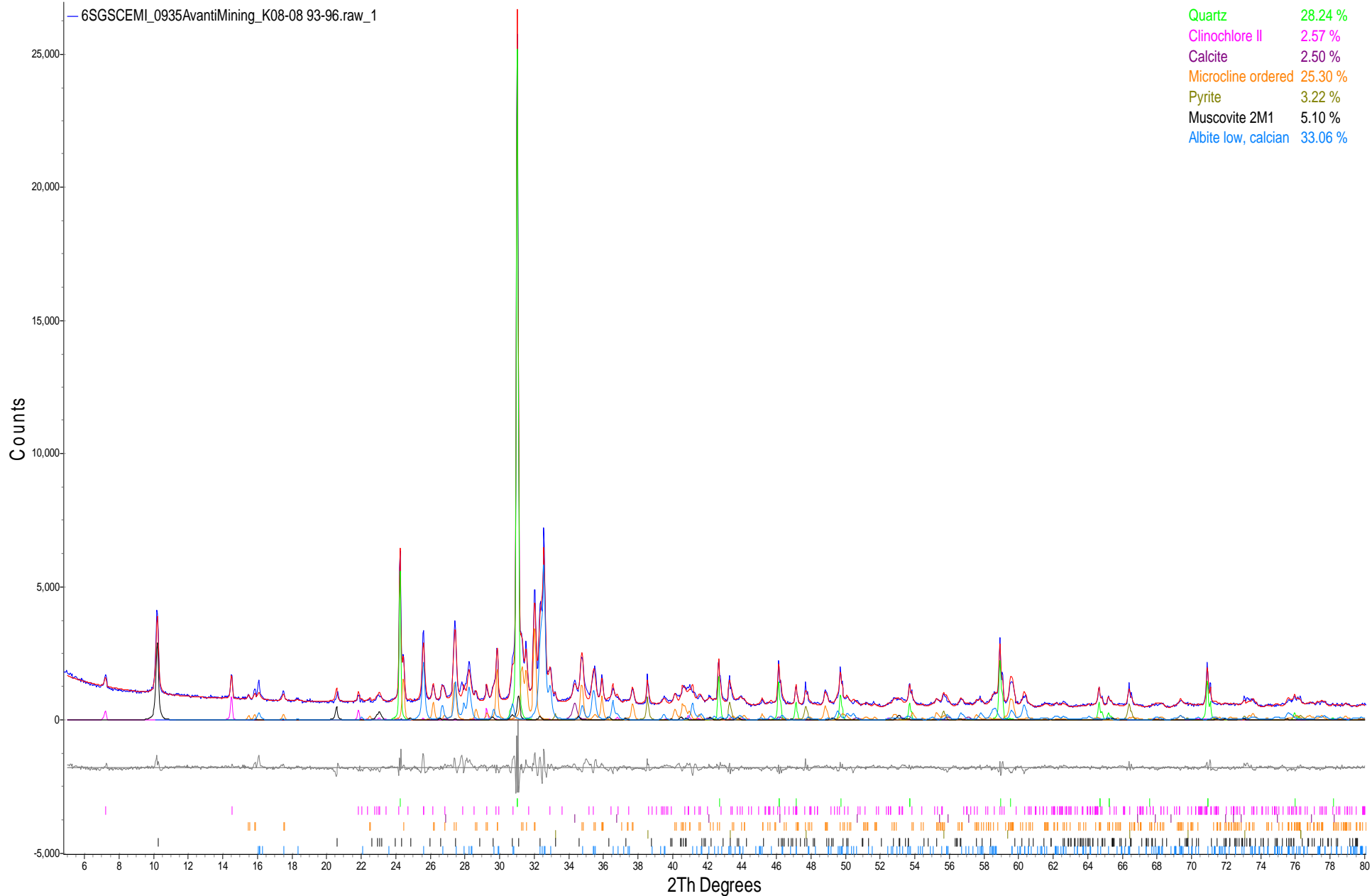


Figure 6. Rietveld refinement plot of sample **SGS CEMI “K08-08 93-96”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

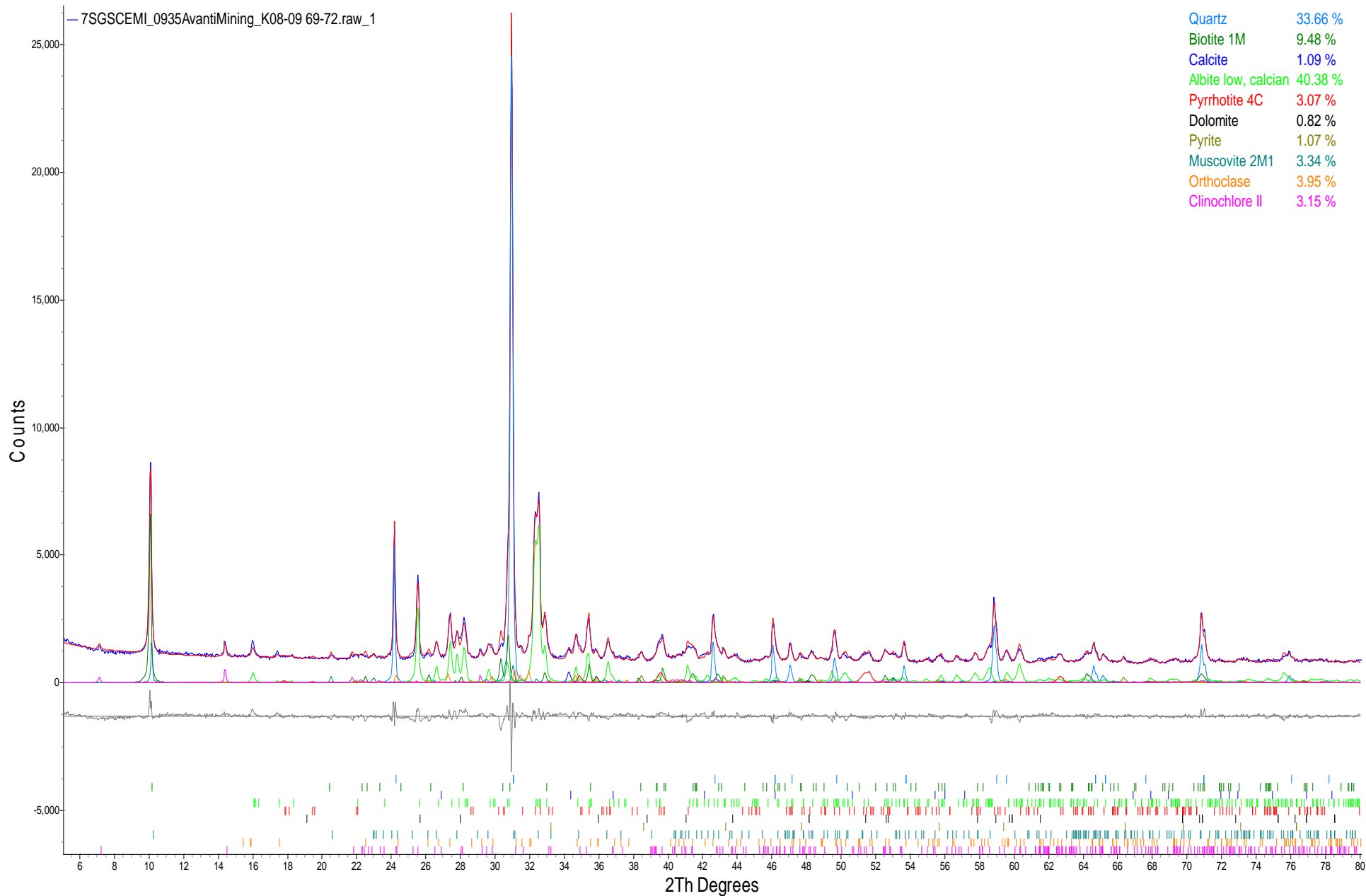


Figure 7. Rietveld refinement plot of sample **SGS CEMI “K08-09 69-72”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

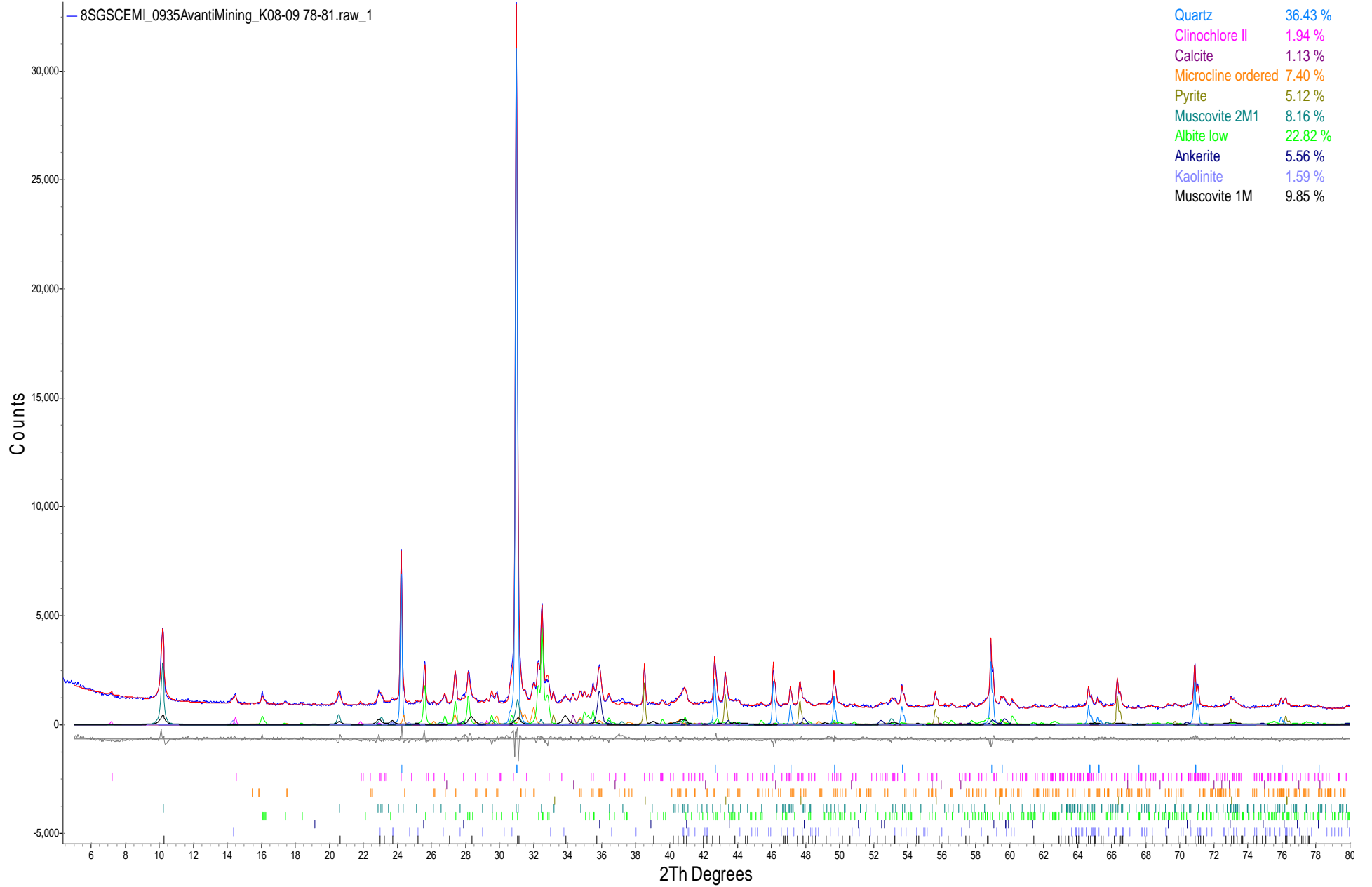


Figure 8. Rietveld refinement plot of sample **SGS CEMI “K08-09 78-81”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

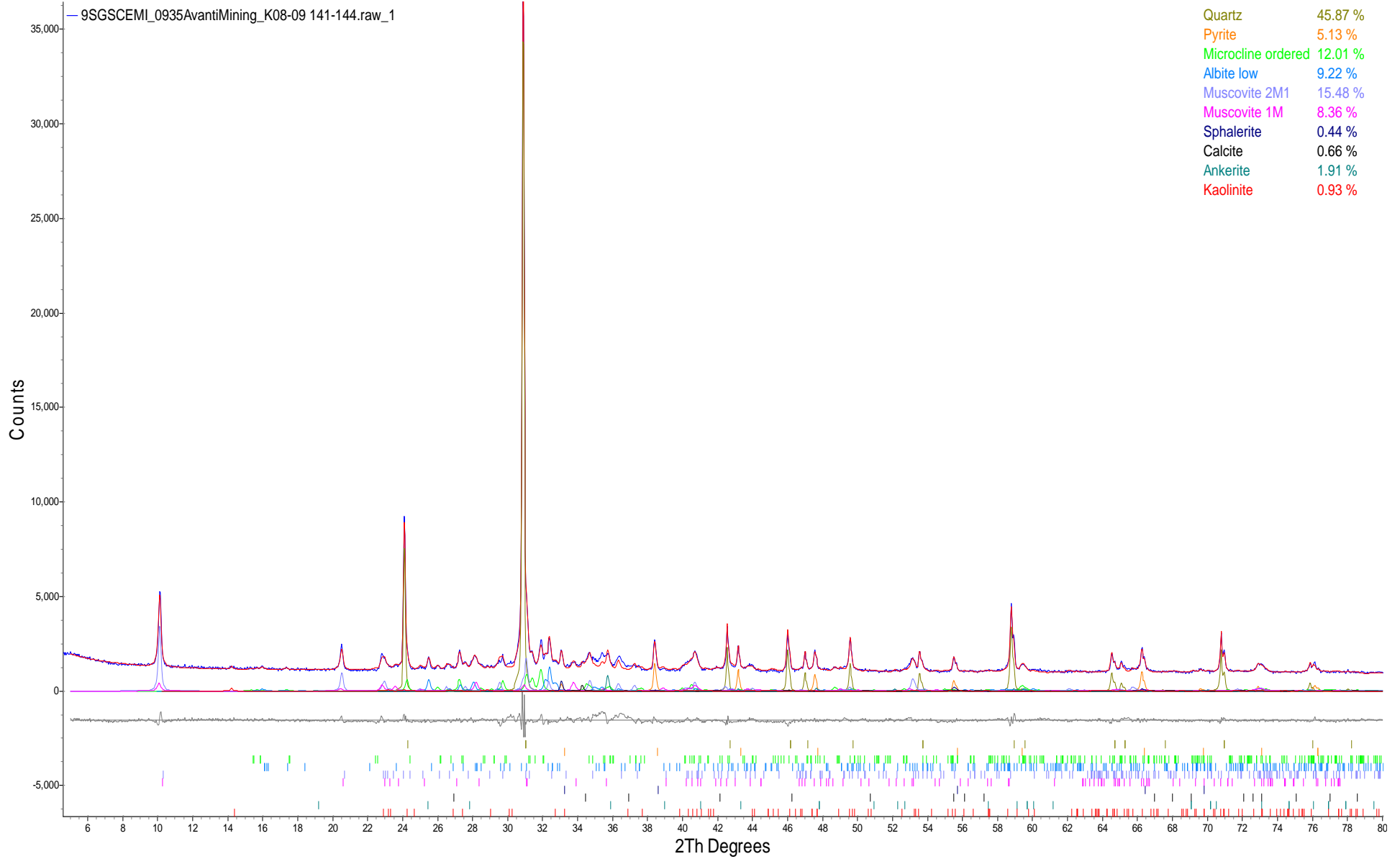


Figure 9. Rietveld refinement plot of sample **SGS CEMI “K08-09 141-144”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

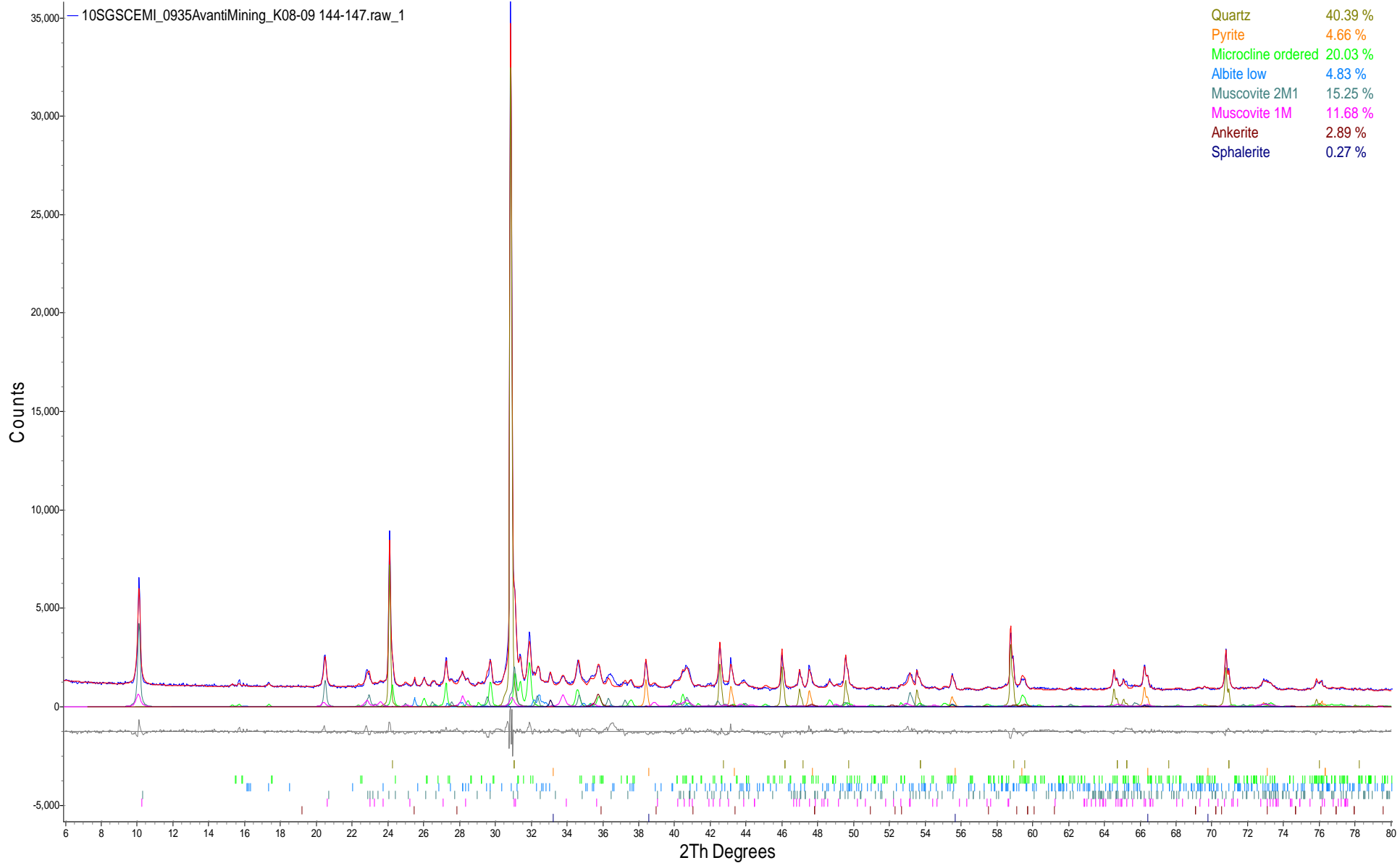


Figure 10. Rietveld refinement plot of sample **SGS CEMI “K08-09 144-147”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

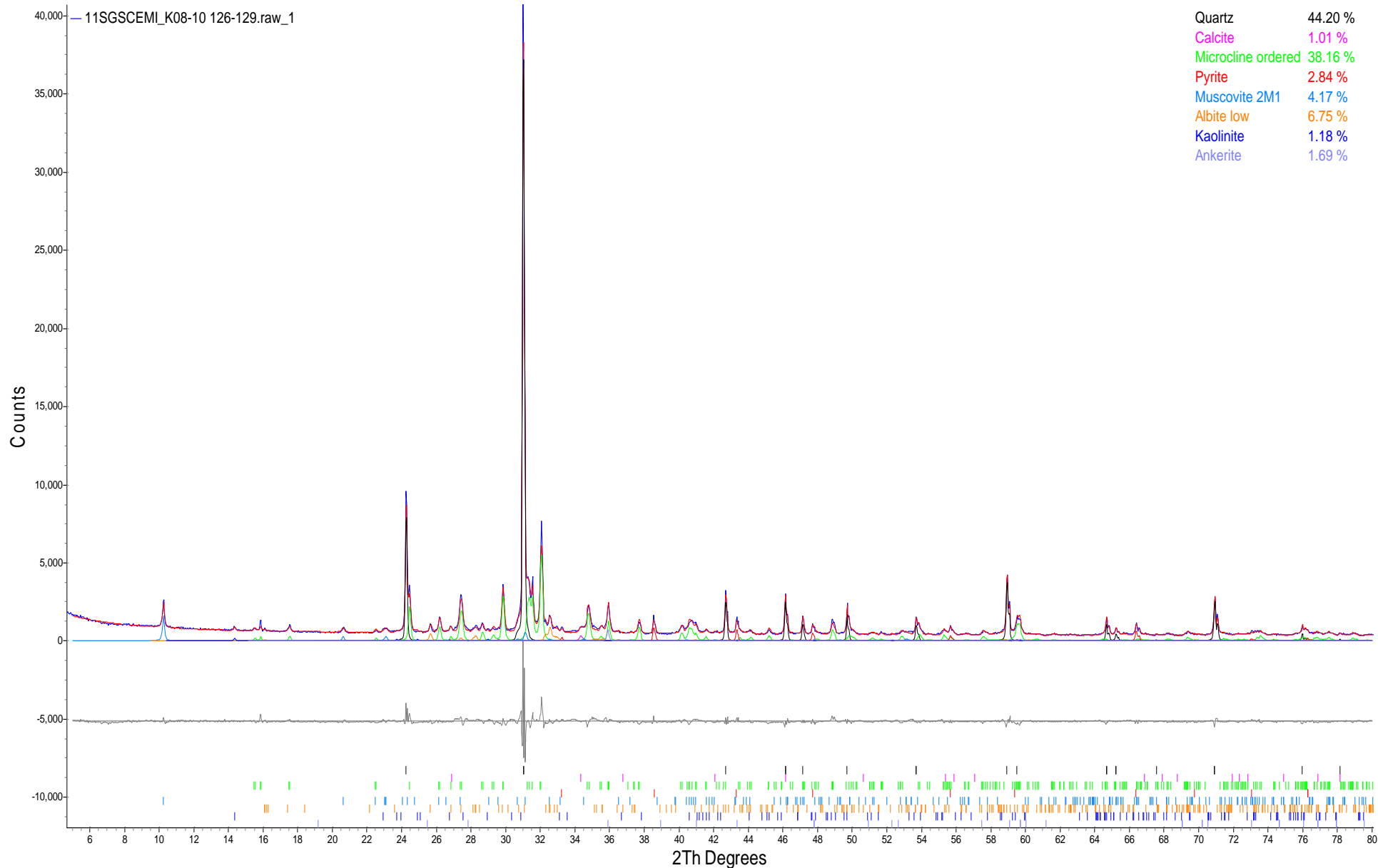


Figure 11. Rietveld refinement plot of sample **SGS CEMI “K08-10 126-129”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

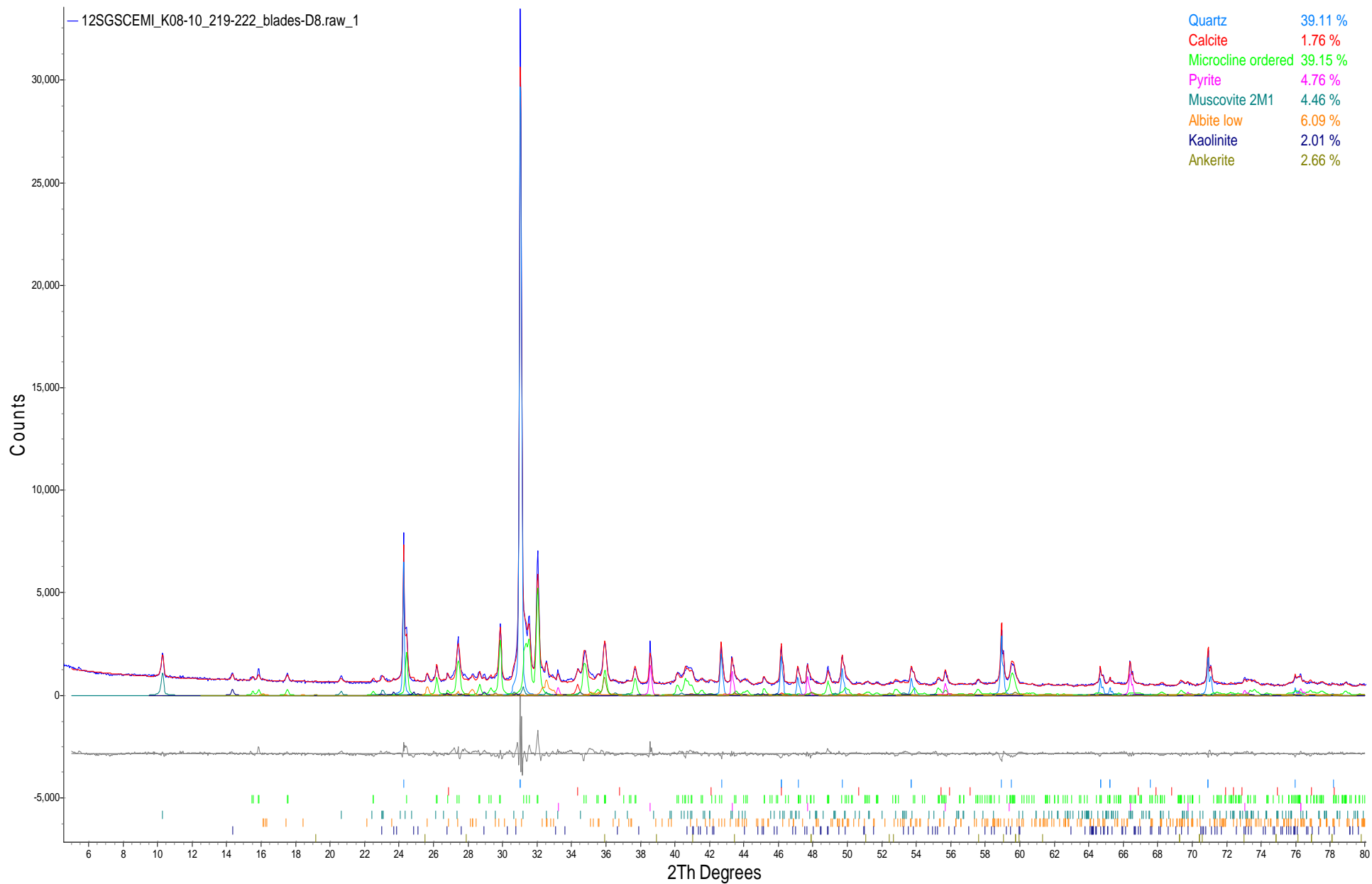


Figure 12. Rietveld refinement plot of sample **SGS CEMI “K08-10 219-222”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

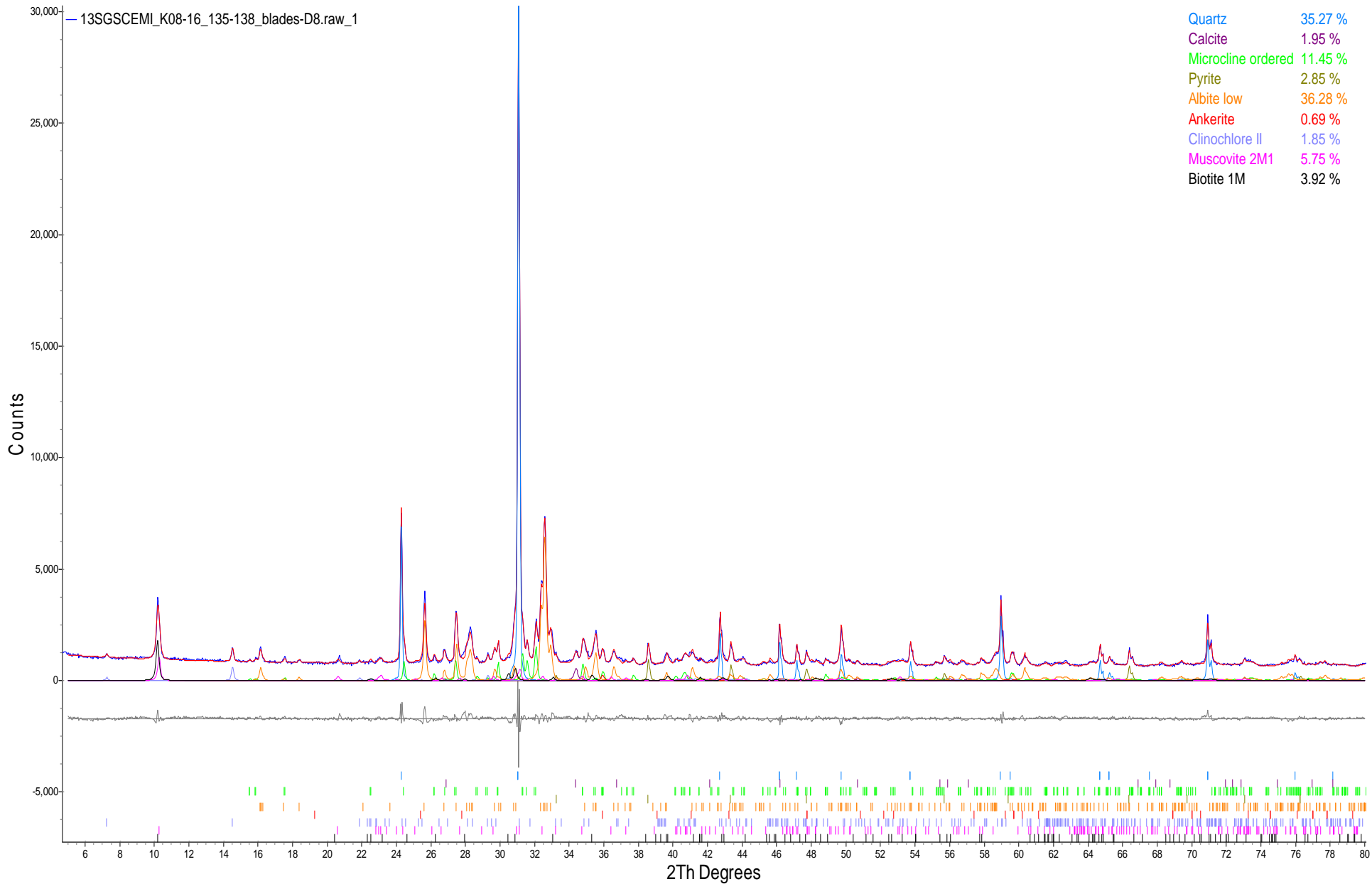


Figure 13. Rietveld refinement plot of sample **SGS CEMI “K08-16 135-138”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

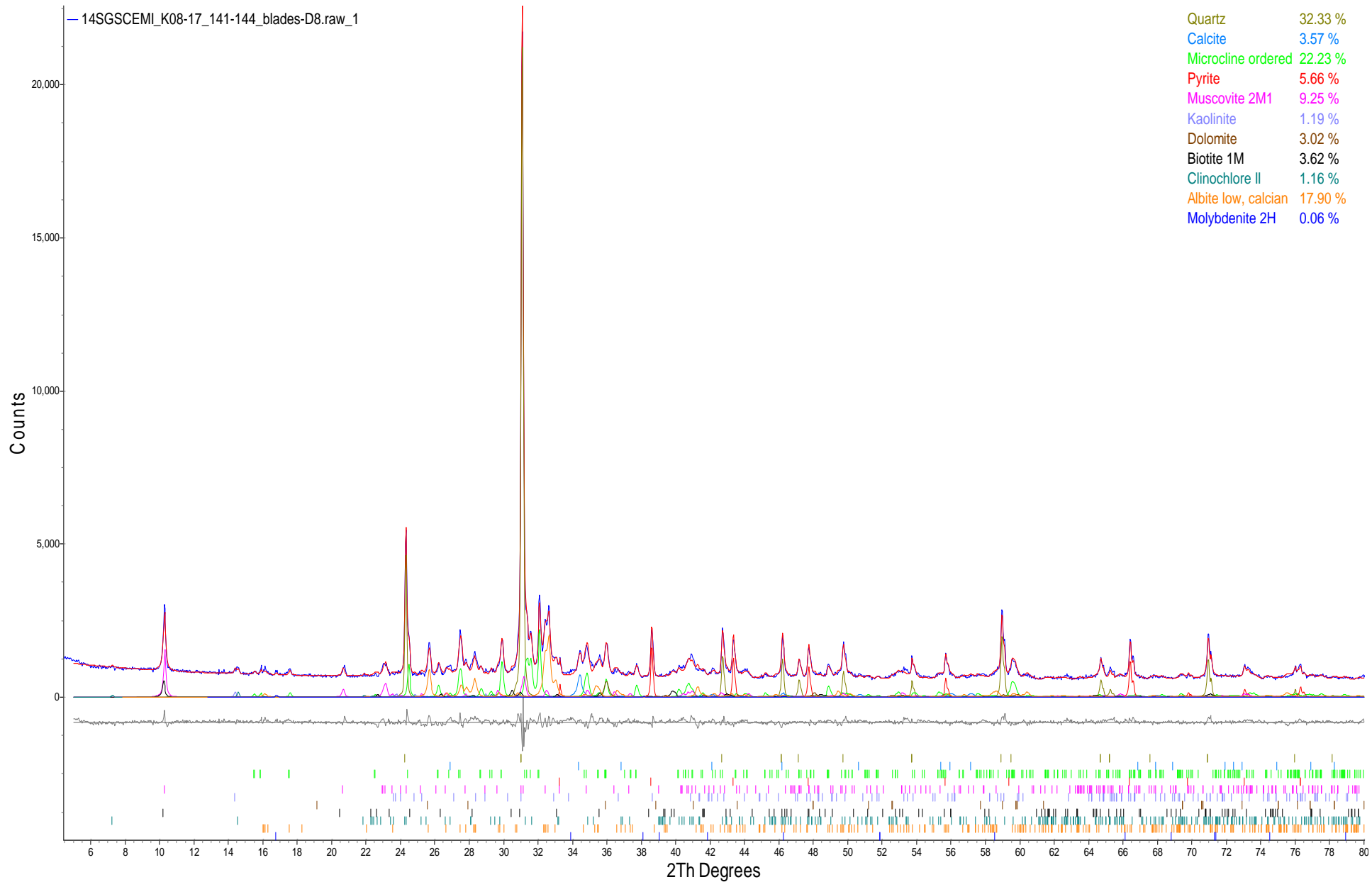


Figure 14. Rietveld refinement plot of sample **SGS CEMI “K08-17 141-144”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

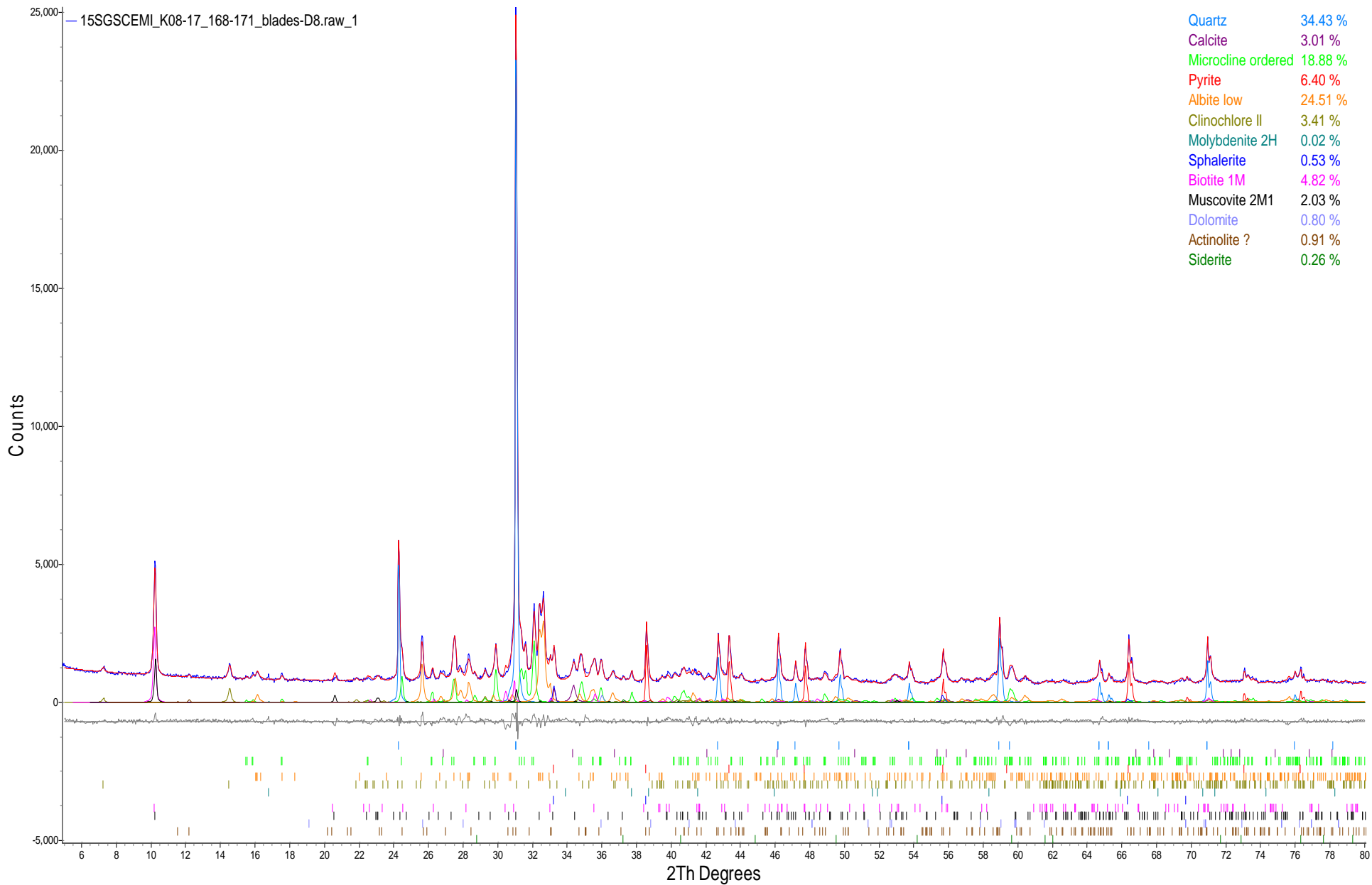


Figure 15. Rietveld refinement plot of sample **SGS CEMI “K08-17 168-171”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

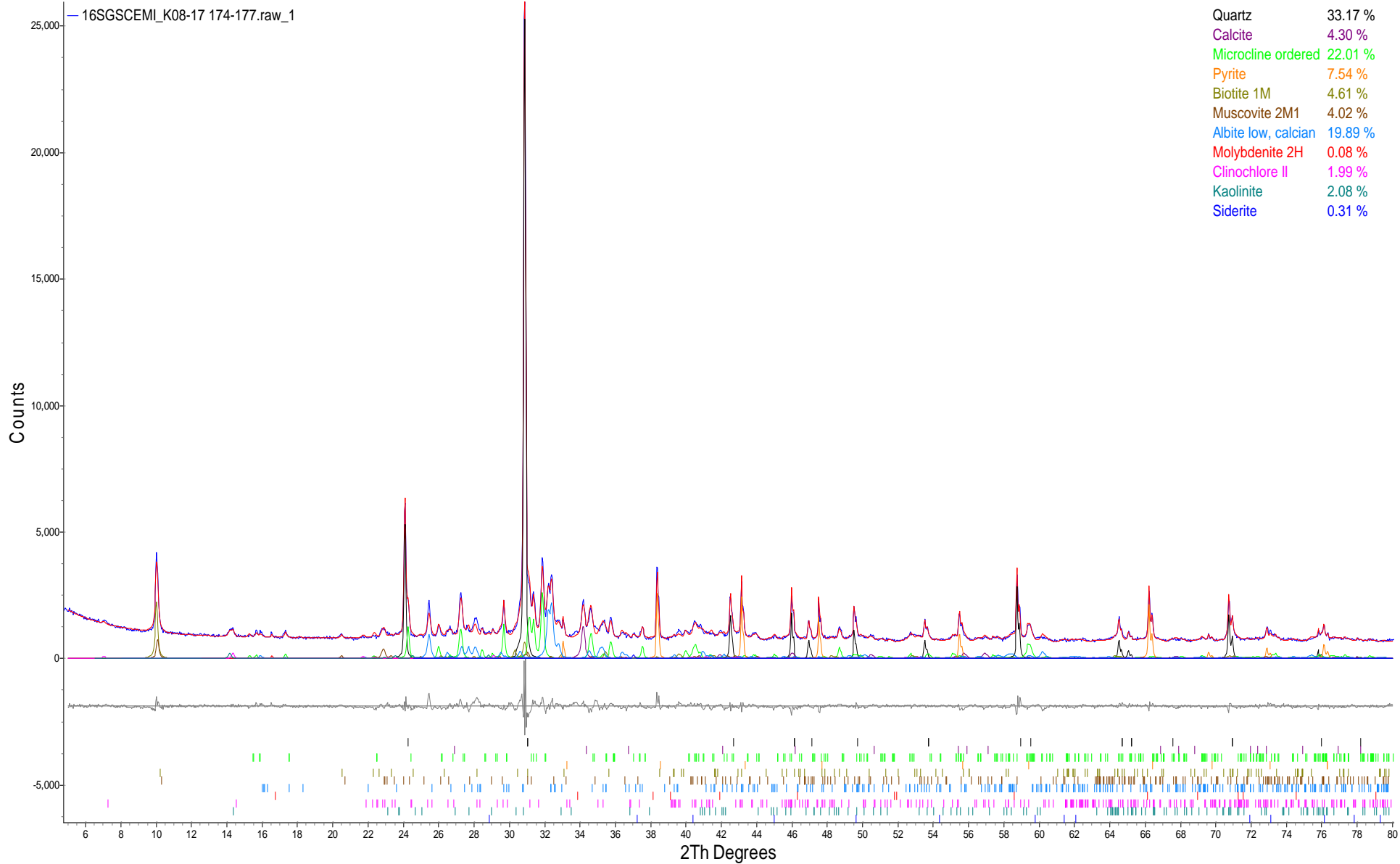


Figure 16. Rietveld refinement plot of sample **SGS CEMI “K08-17 174-177”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

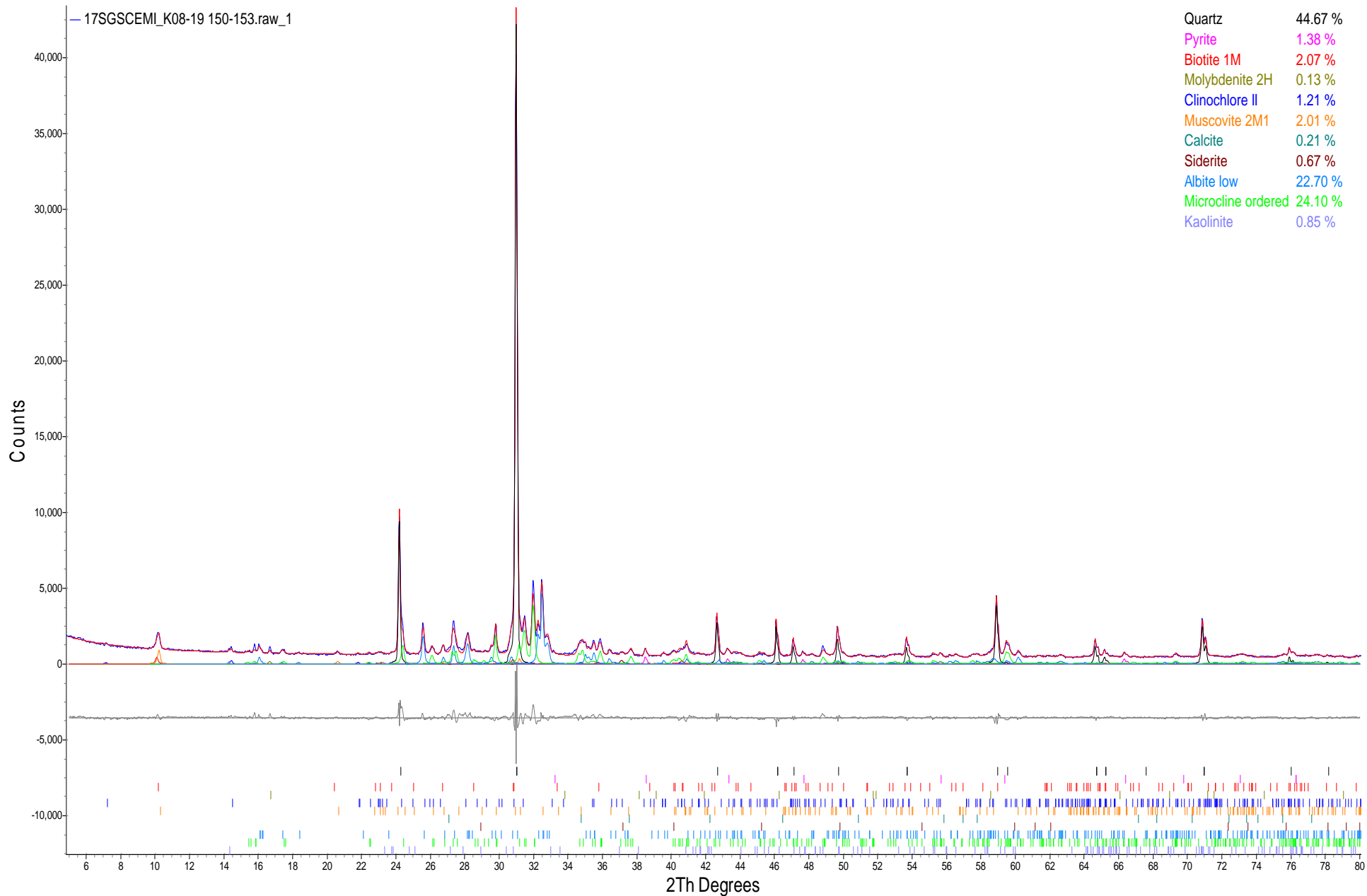


Figure 17. Rietveld refinement plot of sample **SGS CEMI “K08-19 150-153”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

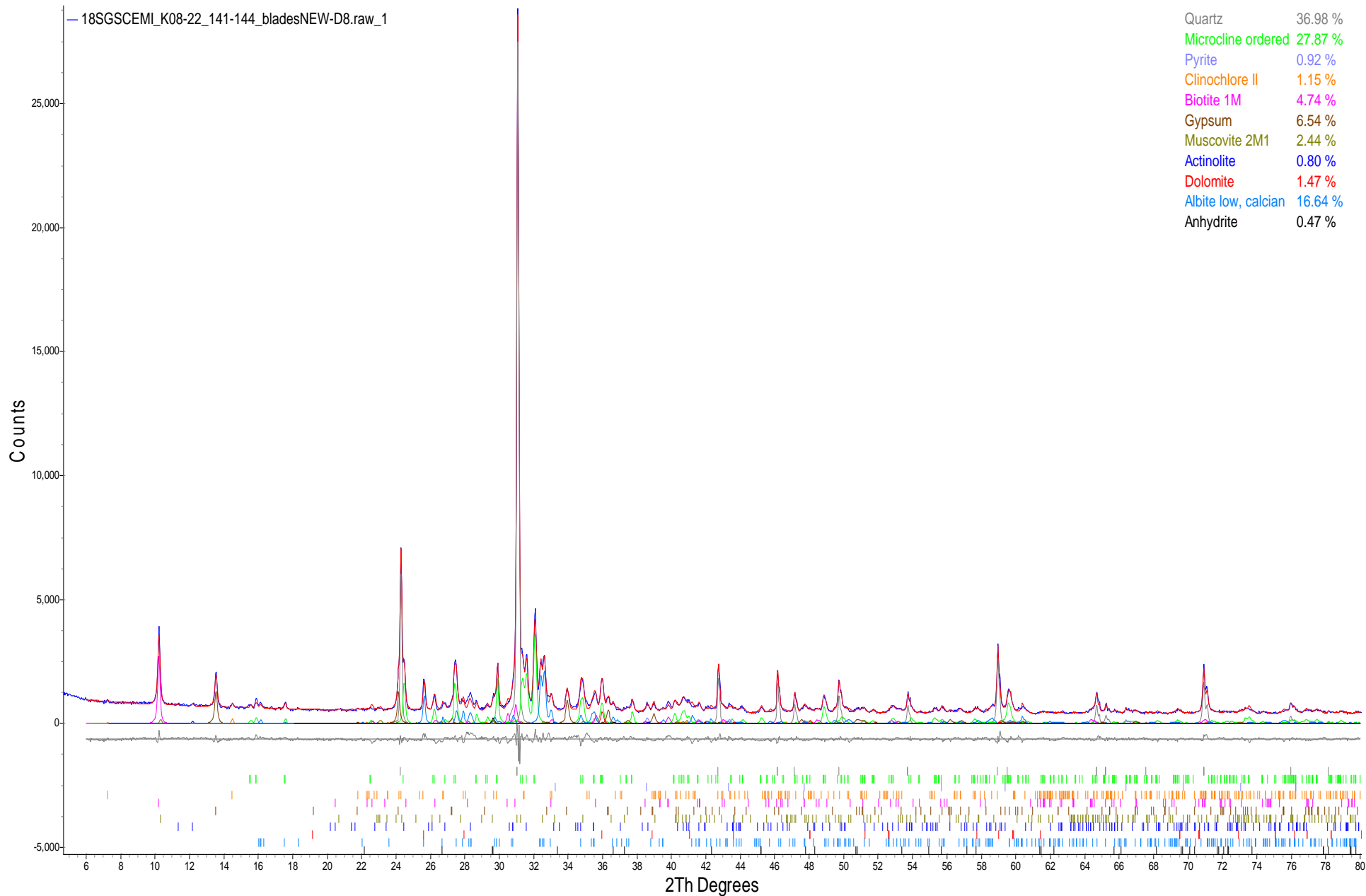


Figure 18. Rietveld refinement plot of sample **SGS CEMI “K08-22 141-144”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

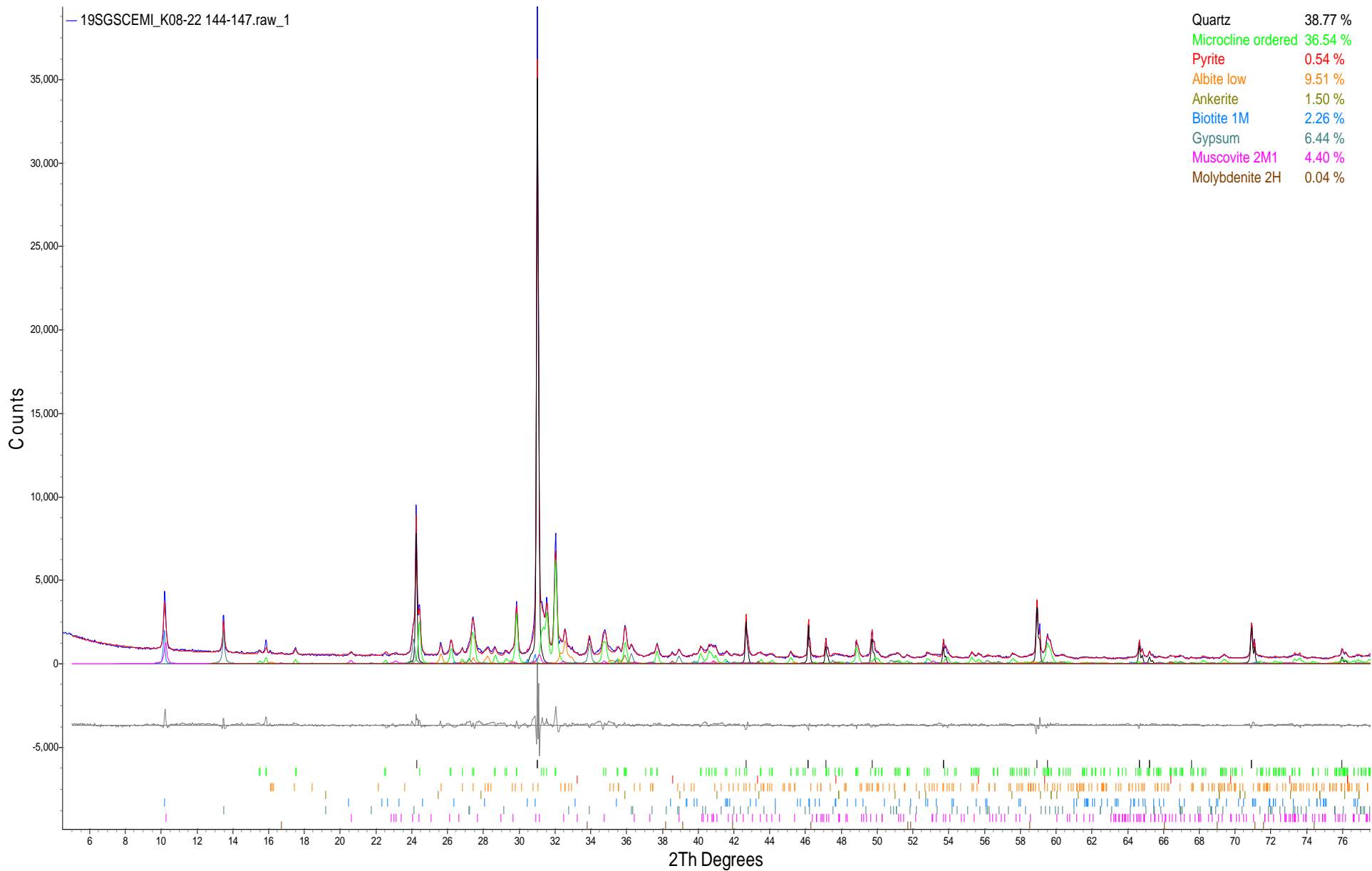


Figure 19. Rietveld refinement plot of sample **SGS CEMI “K08-22 144-147”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

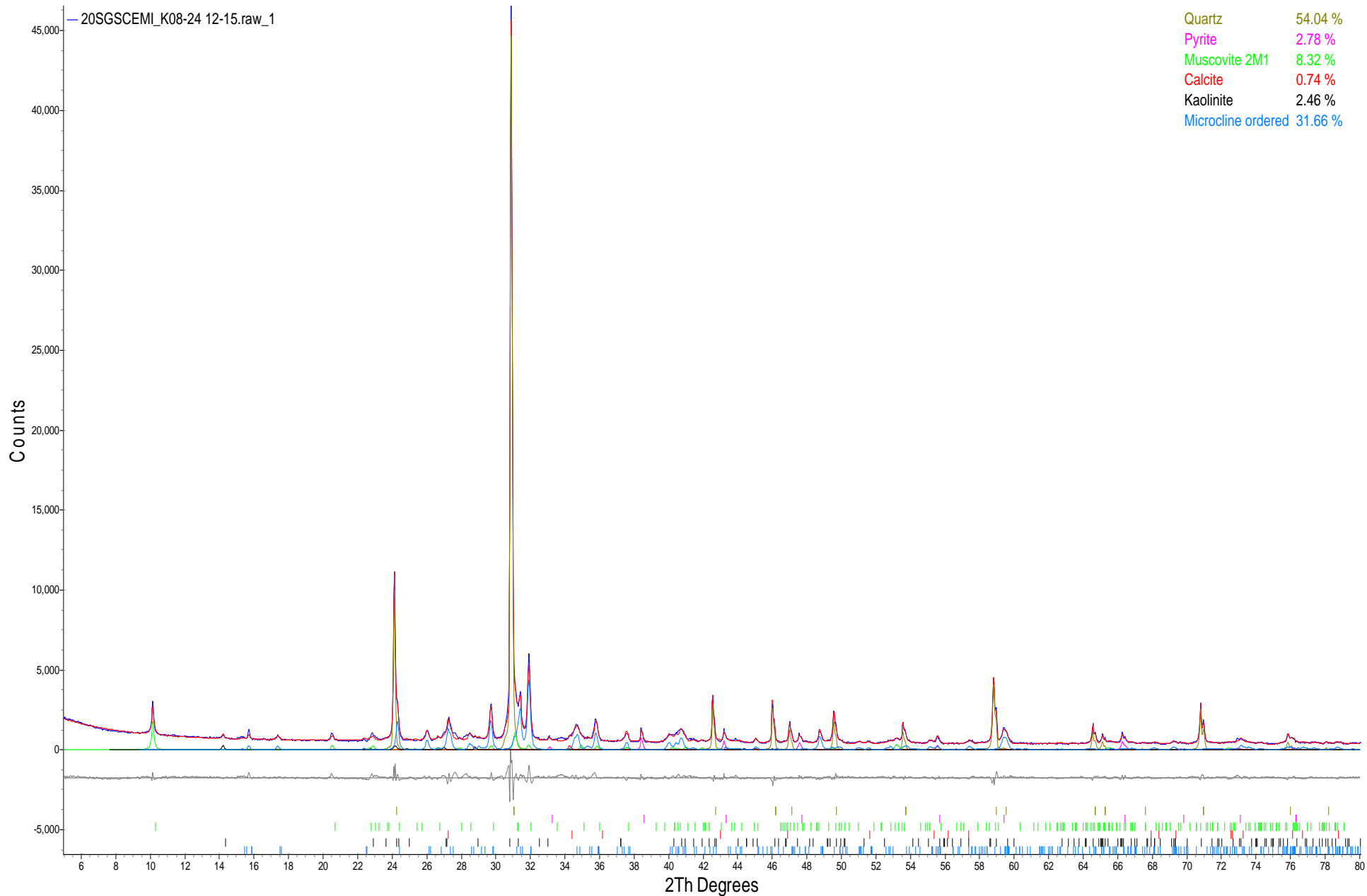


Figure 20. Rietveld refinement plot of sample **SGS CEMI “K08-24 12-15”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

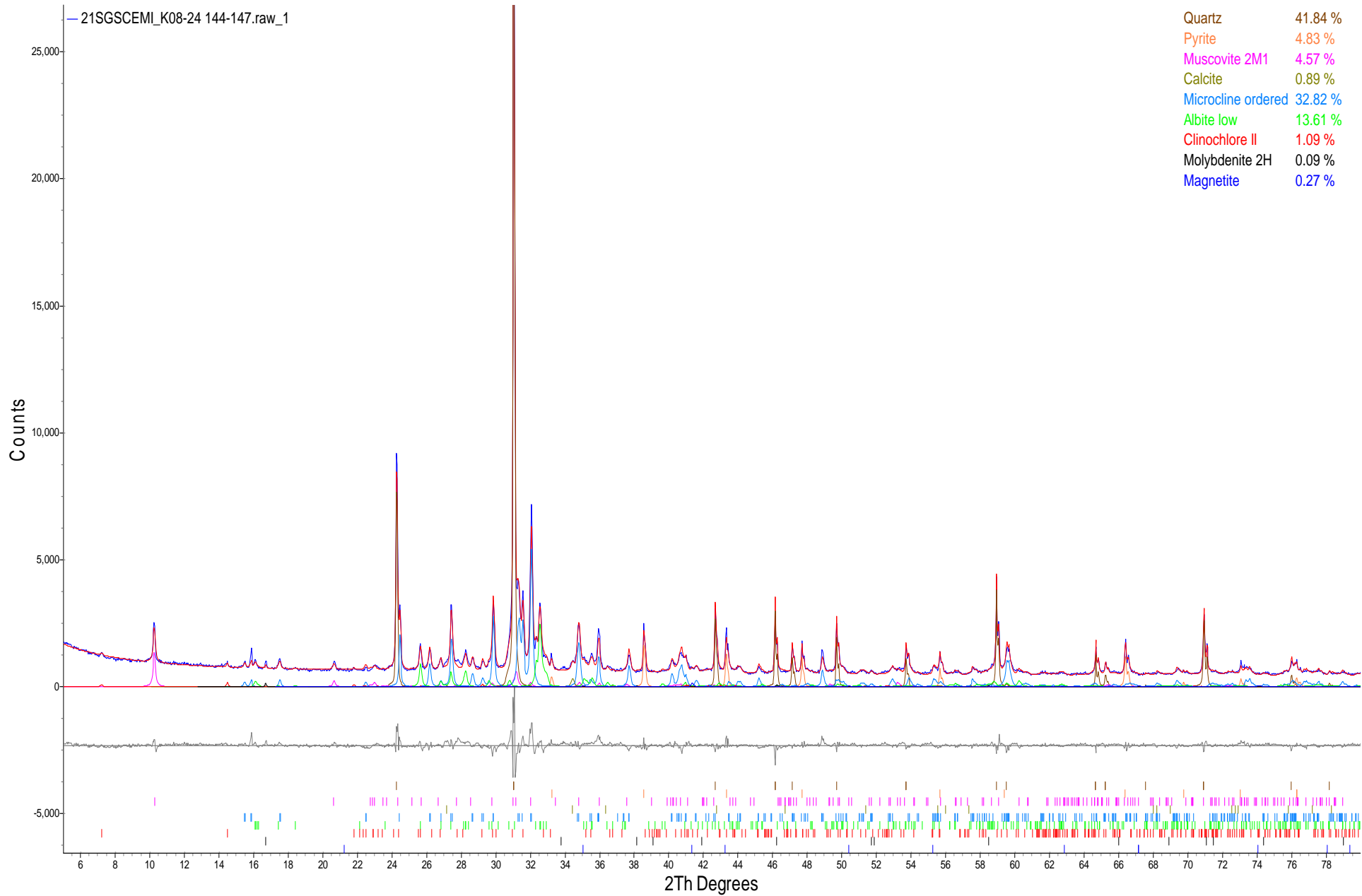


Figure 21. Rietveld refinement plot of sample **SGS CEMI “K08-24 144-147”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

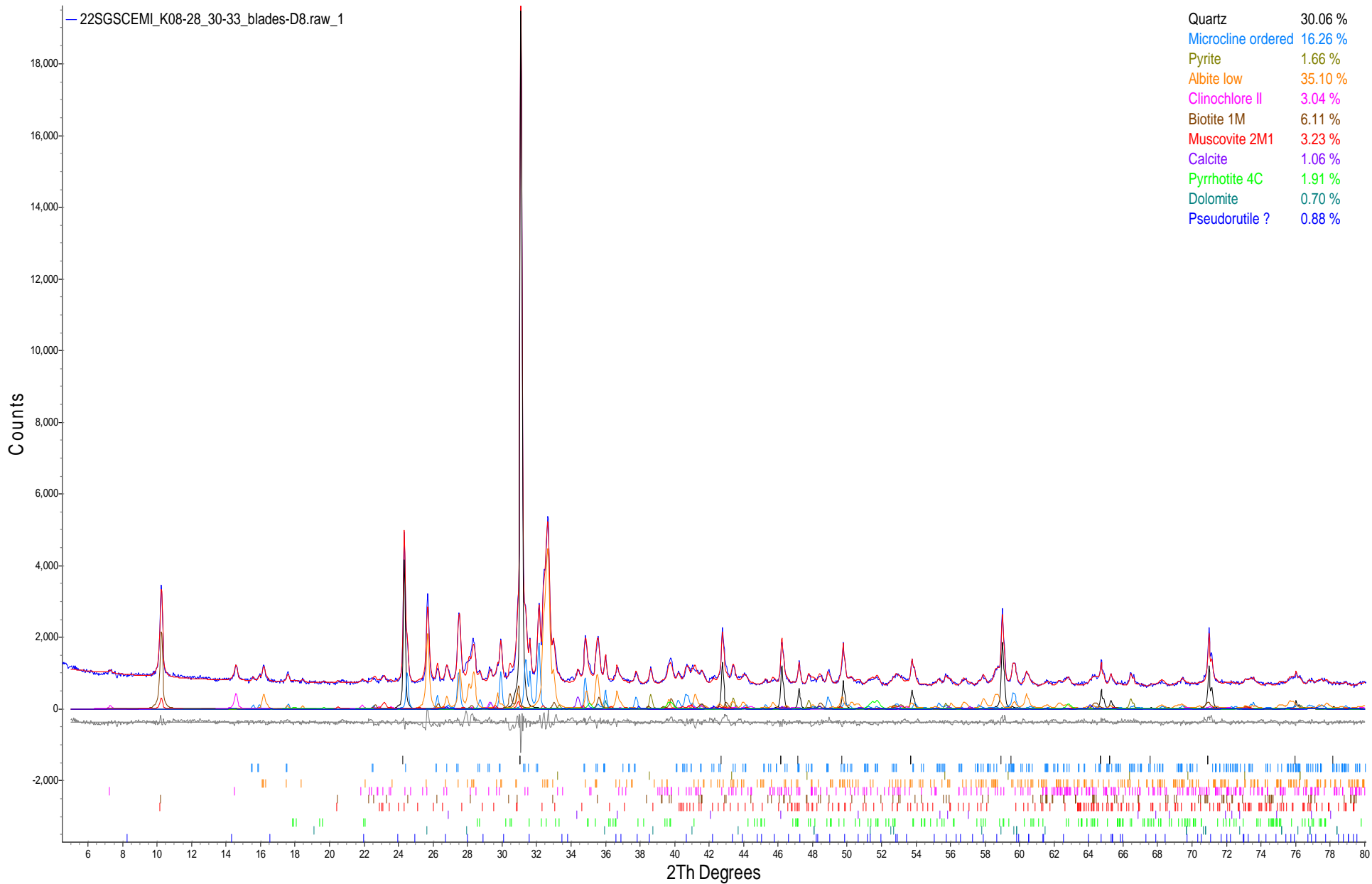


Figure 22. Rietveld refinement plot of sample **SGS CEMI “K08-28 30-33”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

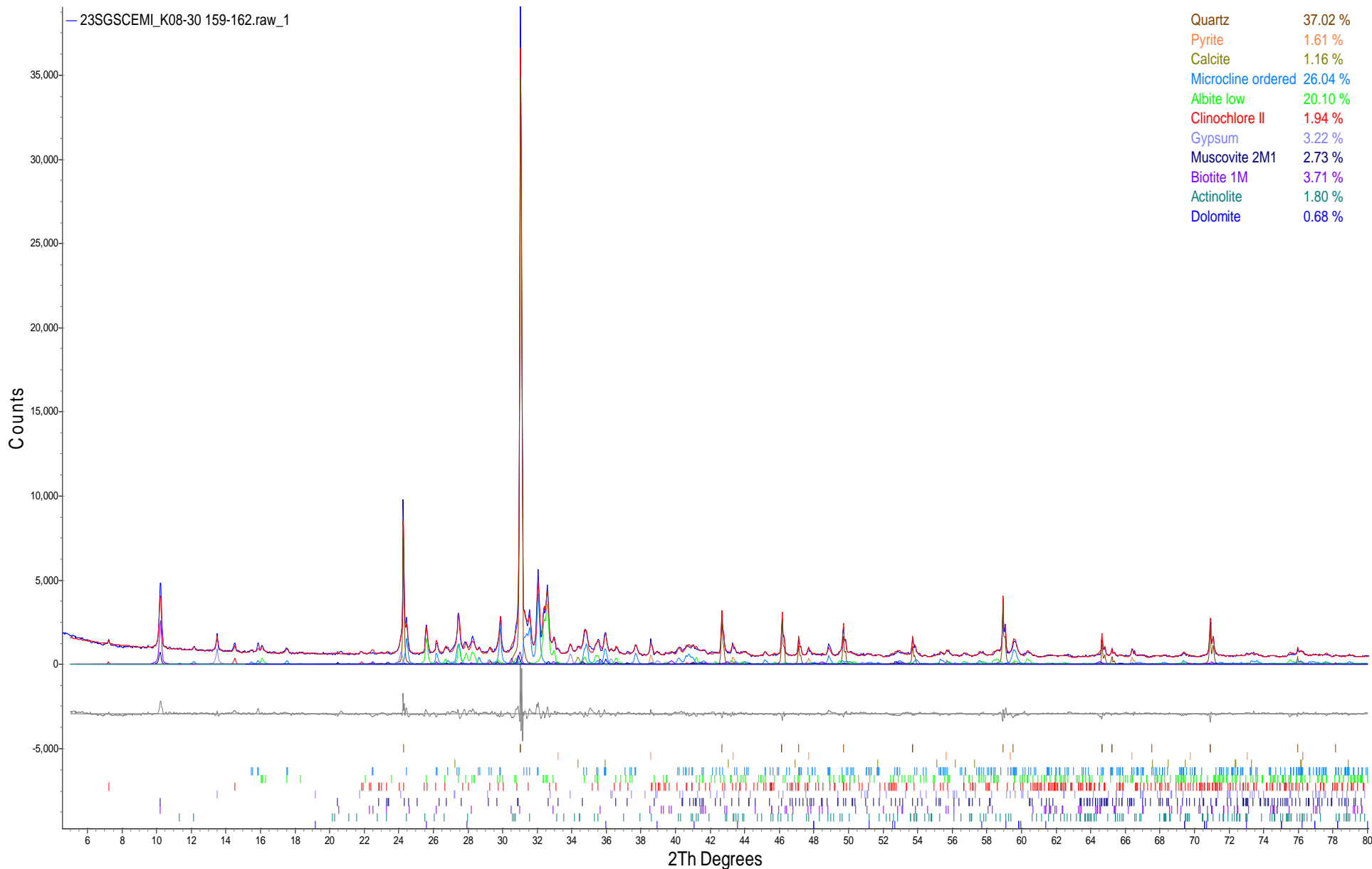


Figure 23. Rietveld refinement plot of sample **SGS CEMI “K08-30 159-162”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

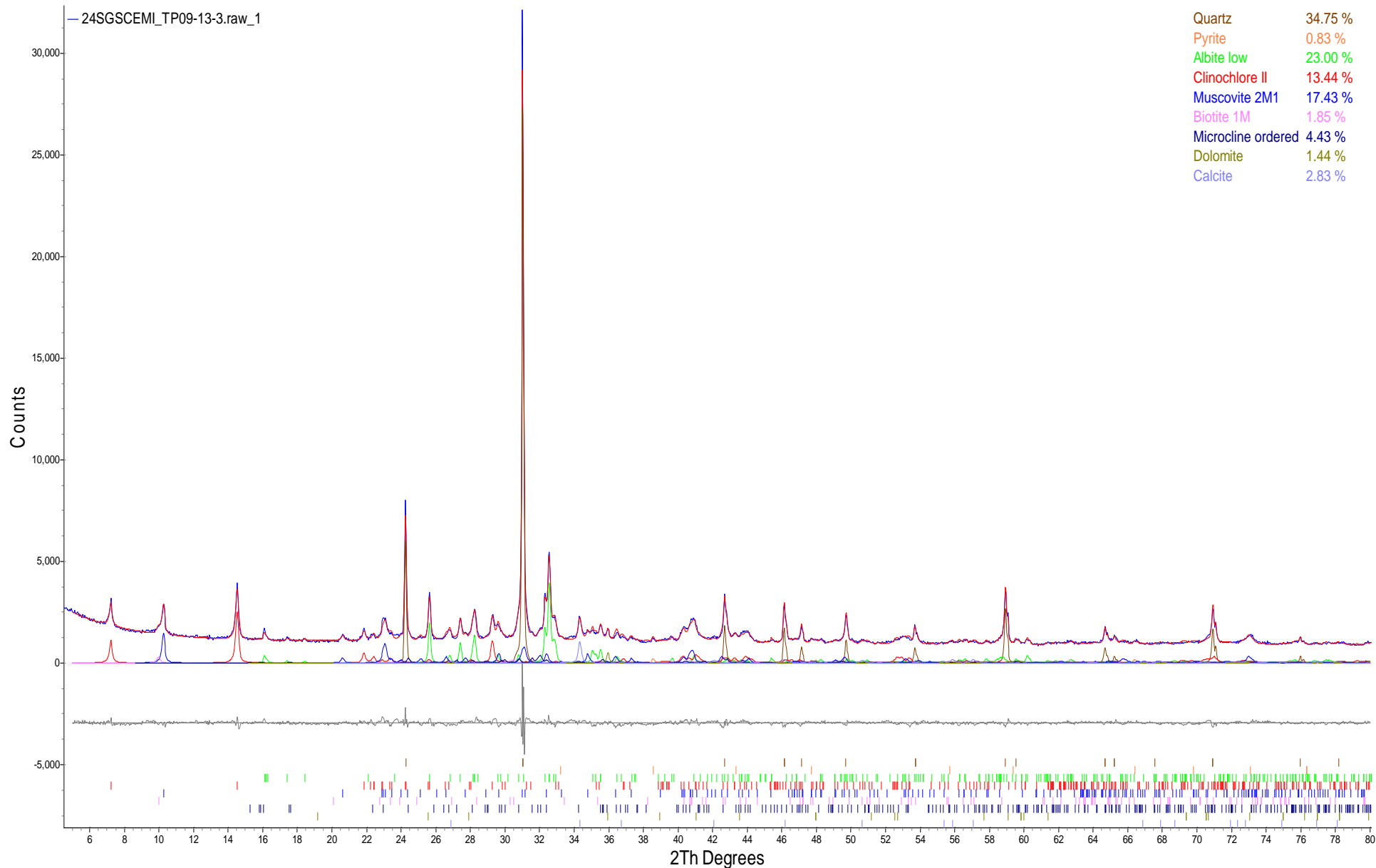


Figure 24. Rietveld refinement plot of sample **SGS CEMI “TP09-13-3”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

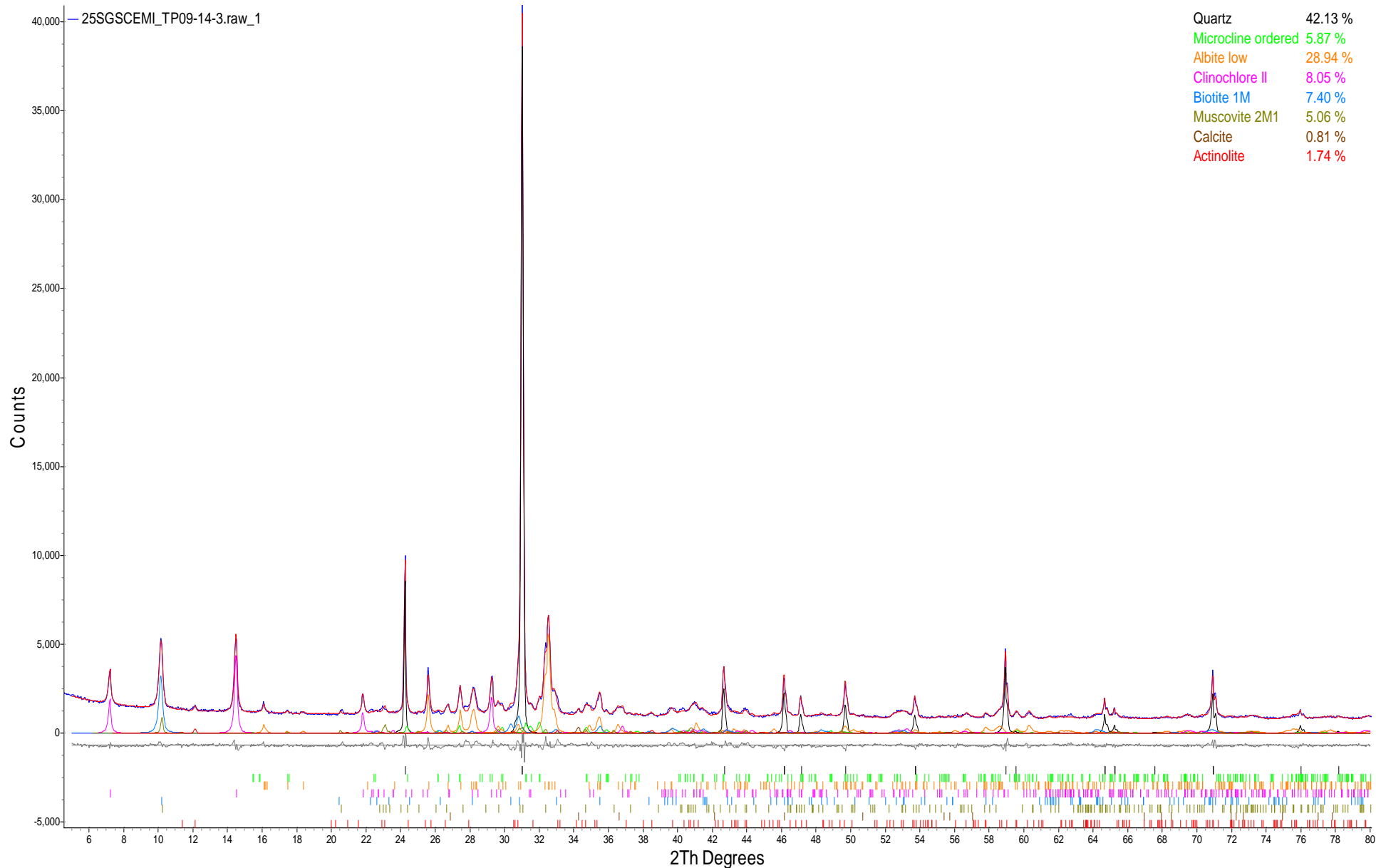


Figure 25. Rietveld refinement plot of sample **SGS CEMI “TP09-14-3”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.





Appendix E4. Kitsault Waste Rock Trace Elements

Sample ID	Geochem Sample Interval & Rock Type Information						with ICP-MS Finish, F by single element assay																																					
	Lithology	Litho Code	Hole ID	Depth-From (m)	Depth-To (m)	Target Percentile	Au	Ag	Al	As	B	Ba	Bi	Ca	Cd	Co	Cr	Cu	F	Fe	Ga	Hg	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Se	Sr	Te	Th	Ti	Tl	U	V	W	Zn
							ppb	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Average Crustal Abundance <sup>1</sup>							4	0.08	8.36	1.8	9	390	0.0082	4.66	0.16	29	122	68	0.055	6.22	19	0.086	1.84	34.6	2.76	1060	1.2	2.27	99	0.112	13	0.034	0.2	25	0.05	384		8.1	0.632	0.72	2.3	136	1.2	76
10x Average Crustal Abundance for Comparison <sup>1</sup>							40	0.8	83.6	18	90	3900	0.082	46.6	1.6	290	1220	680	0.55	62.2	190	0.86	18.4	346	27.6	10600	12	22.7	990	1.12	130	0.34	2	250	0.5	3840		81	6.32	7.2	23	1360	12	760
K10-06-GT 32-45	Patsy Dump						2.3	2.3	0.65	4.4	20	239	2.6	1.01	3.7	2.7	39	1340.8	0.02	1.08	1	0.07	0.07	4	0.15	150	201.3	0.017	15.4	0.087	56.8	0.55	5.1	0.2	0.5	178	0.2	0.1	0.004	0.1	0.7	8	3.9	118
K10-06-GT 45-47	Patsy Dump						0.5	0.2	2.8	13.4	20	155	0.3	0.17	0.2	11.8	125	42.2	0.03	3.44	7	0.06	0.18	9	1.41	562	3.7	0.015	78.6	0.063	13.9	0.06	0.6	5.4	0.5	16	0.2	1.7	0.045	0.2	0.8	56	0.1	110
K10-06-GT 47-51	Patsy Dump						1.3	0.2	2.41	11.4	20	181	0.4	0.41	0.3	13.1	126	74.2	0.02	3.38	7	0.05	0.22	12	1.36	570	7.6	0.025	72.2	0.083	14.3	0.1	0.6	5.3	0.5	29	0.2	2	0.054	0.2	0.9	60	0.8	107
K10-08-GT SPT 08-14	Patsy Dump						38.3	4.8	0.67	5	20	88	13.4	1.58	18	7	164	82.3	0.09	2.09	3	0.03	0.21	19	0.38	644	209.1	0.032	12.7	0.091	166	1.35	0.5	1.3	0.5	148	0.4	6	0.019	0.1	6.9	19	31.7	536
K10-08-GT SPT 08-29	Patsy Dump						2.9	4.9	0.4	4.7	20	84	13.3	2.1	41.1	5.5	170	63.3	0.07	1.79	2	0.06	0.17	11	0.31	1097	166.1	0.007	7.2	0.058	242.6	1.32	1.1	1	0.5	99	0.5	4.4	0.024	0.2	1.7	28	>100.0	1300
K10-08-GT SPT 08-34	Patsy Dump						4.2	14.4	0.72	6.7	20	73	35.5	2.68	100.8	5.5	144	62.6	0.24	1.88	3	0.35	0.28	15	0.43	1768	253.2	0.008	6.4	0.072	572.2	1.54	1.4	1.4	1.3	189	0.4	4.7	0.007	0.2	1.6	20	17.3	2734
K10-08-GT SPT 08-49	Patsy Dump						6.9	2.8	0.92	3.2	20	77	8.1	1.15	8.2	5.3	91	58.7	0.05	3.93	6	0.07	0.16	13	0.51	880	189.6	0.009	10.8	0.08	84	0.57	0.6	1.6	0.7	89	0.3	2.3	0.066	0.2	2.9	40	23	288
K10-10-GT 34-36	Patsy Dump						15	1.4	1.05	2.7	20	293	1.1	0.53	3.2	9.3	131	43.8	0.06	2.31	6	0.01	0.53	8	0.6	522	44.5	0.039	25.9	0.049	40.7	0.58	0.8	6.4	0.9	26	0.2	2.7	0.099	0.4	1.2	70	0.5	195
K10-10-GT 59-61	Patsy Dump						1.4	0.2	2.09	3.7	20	383	0.4	0.97	0.3	16.8	93	51.5	0.06	4.28	9	<0.01	1.18	6	1.17	938	14.7	0.113	31.1	0.097	4.6	0.71	0.1	9.8	1.4	68	0.2	1	0.278	0.8	0.2	113	1.4	98
K10-10-GT 64-66	Patsy Dump						4	0.5	1.03	10.3	20	175	1	0.78	1.2	11.1	122	64.1	0.09	2.65	5	<0.01	0.65	6	0.56	684	22.8	0.051	26.1	0.033	4.8	0.86	0.4	6.7	1.2	43	0.2	1.7	0.071	0.5	0.4	51	5.2	83
K10-10-GT 74-76	Patsy Dump						1.4	0.6	1.56	4.5	20	98	1.4	0.26	1.6	5.5	101	21.8	0.02	1.38	8	0.09	0.12	23	0.28	254	53	0.013	19.8	0.055	20.8	0.25	0.3	1.2	1.3	21	0.2	0.1	0.029	0.1	0.9	38	1.5	69
K10-10-GT SPT 10-29	Patsy Dump						8.9	14.3	0.64	10.7	20	154	59	1.59	27.4	7.1	107	48.6	0.04	1.94	3	0.01	0.18	14	0.4	901	107.1	0.016	13.4	0.061	621.5	0.97	1.3	2.2	1	97	0.6	3.5	0.019	0.2	0.9	28	38.7	824
K10-10-GT SPT 10-34	Patsy Dump						2.1	0.6	2.22	10.6	20	246	1.1	1.07	1.7	20.7	146	93.9	0.05	4.22	8	0.01	0.96	5	1.18	646	55.9	0.044	88.2	0.062	18.2	1.35	0.5	7.6	1.7	62	0.3	1.6	0.142	0.6	0.5	89	6.9	116
K10-10-GT SPT 10-524	Patsy Dump						15.7	35.8	0.94	7.8	20	171	111.5	1.71	63.9	8.3	104	49.5	0.08	2.42	4	0.14	0.43	11	0.56	983	250	0.023	23	0.08	1371.1	0.94	0.9	3.5	2	85	0.5	2.7	0.045	0.3	1.1	38	21.9	1742
K10-10-GT SPT 10-629	Patsy Dump						2.8	2.4	0.44	0.5	20	188	6.9	0.53	4.6	3.4	113	9.2	0.12	1.27	2	0.02	0.26	17	0.3	252	52	0.012	4.2	0.083	91.4	0.85	0.3	1	0.5	35	0.2	5.4	0.02	0.1	1.3	12	4.8	158
K10-11-GT SPT 11-28	Patsy Dump						1.4	0.2	1.41	6.6	20	288	0.3	1.06	0.5	12	101	70.1	0.05	3.24	9	<0.01	0.65	7	0.81	750	30.9	0.049	35.4	0.26	7.4	0.87	0.5	11.5	1.7	25	0.2	1.2	0.114	0.4	0.3	90	0.8	88
K10-11-GT SPT 11-313	Patsy Dump						5	1.1	1.36	13.2	20	166	0.6	0.82	7.6	14.2	127	66	0.06	2.99	6	<0.01	0.63	4	0.7	652	18.1	0.066	34.3	0.048	170.9	1.07	0.9	8.7	1.5	34	0.2	1	0.118	0.4	0.3	93	13.1	258
K10-11-GT SPT 11-418	Patsy Dump						2.2	0.4	2.23	17.7	20	148	0.4	0.89	0.9	17.1	95	110.6	0.06	4.39	9	<0.01	1.3	7	1.19	709	14.5	0.115	34.2	0.146	6.6	1.47	0.1	15	3.2	42	0.2	0.8	0.195	0.8	0.4	133	0.7	91
K10-11-GT SPT 11-524	Patsy Dump						1.3	0.3	0.95	20.3	20	120	0.2	1.46	0.4	10.7	187	97.4	0.08	2.07	3	<0.01	0.48	3	0.46	568	11.2	0.033	36.3	0.045	5	0.9	0.2	3.5	1	61	0.3	0.9	0.039	0.3	0.6	35	3.9	45
P25							2.175	1.175	0.5675	1.2	20	176.5	2.275	0.61	2.75	4.5	89.75	29.3	0.04	1.3175	2	0.02	0.2	7	0.31	365	80.175	0.009	7.55	0.064	56.05	0.5	0.5	1.4	0.5	35	0.2	1.7	0.02	0.1	0.7	18	4.35	121.5
P50							4.4	2.3	0.755	4.6	20	249	6.5	1.055	5.9	6.95	102.5	53	0.06	1.83	3	0.03	0.27	13	0.44	636.5	205.7	0.015	14.6	0.075	111.6	0.76	0.9	2.05	0.7	50.5	0.2	3.65	0.0365	0.2	1.1	27	11.3	222
P75							7.9	4.325	1.1525	13.8	20	380	13.85	1.4375	12.55	11.65	122.25	78.125	0.0825	2.9075	5	0.06	0.4425	16	0.7025	818	289.45	0.02825	31.6	0.086	208.025	1.0325	1.725	4.55	1.2	68	0.2	5	0.0735	0.3	1.6	48.25	30.95	429
K08-19 150-153	Alaskite (Aplite)	4	K08-19	150	153	50th Percentile	5.6	0.5	0.37	39.4	20	33	1.4	0.25	2.4	8.5	97	62.5	0.04	1.52	2	0.01	0.18	11	0.19	400	629.1	0.035	8.3	0.035	25.5	0.77	3.5	3.1	0.9	28	10.2	10.5	0.015	0.1	5.2	17	6.1	104
K08-22 111-114	Alaskite (Aplite)	4	K08-22	111	114	50th Percentile	1.7	0.2	0.26	0.6	20	183	0.4	0.71	0.8	1.5	81	5.6	0.04	0.43	1	0.01	0.18	9	0.14	219	336.9	0.011	2.6	0.022	23.8	0.41	0.4	0.6	0.5	149	6.9	0.019	0.1	0.8	7	0.7	37	
P25							2.675	0.275	0.2875	10.3	20	70.5	0.65	0.365	1.2	3.25	85	19.825	0.04	0.7025	1.25	0.01	0.18	9.5	0.1525	264.25	409.95	0.017	4.025	0.02525	24.225	0.5	1.175	1.225	0.6	58.25	7.725	0.016	0.1	1.9	9.5	2.05	53.75	
P50							3.65	0.35	0.315	20	20	108	0.9	0.48	1.6	5	89	34.05	0.04	0.975	1.5	0.01	0.18	10	0.165	309.5	483	0.023	5.45	0.0285	24.65	0.59	1.95	1.85	0.7	88.5	8.55	0.017	0.1	3	12	3.4	70.5	
P75							4.625	0.425	0.3425	29.7	20	145.5	1.15	0.595	2	6.75	93	48.275	0.04	1.2475	1.75	0.01	0.18	10.5	0.1775	354.75	556.05	0.029	6.875	0.0375	25.075	0.68	2.725	2.475	0.8	118.75	9.375	0.018	0.1	4.1	14.5	4.75	87.25	
K08-06 12-15	diorite	2	K08-06	12	15	95th Percentile	2.7	1.3	1.35	0.5	20	88	3.6	1.15	4.4	27.5	58	189.1	0.06	4.2	7	0.01	0.91	15	1.35	570	405.1	0.049	11.3	0.159	81	2.61	0.2	4.5	2	77	3.8	0.199	0.6	1.4	87	7.9	173	
K08-13 228-231	diorite	2	K08-13	228	231	95th Percentile	19.3	5.3	0.53	2.8	20	89	14.8	2.46	19.7	12.6	44	68.4	0.1																									



Appendix E5. Kitsault Waste Rock Net Acid Generation (NAG) Tests

Sample ID	Method	Units	Blank	Patsy Dump 01	Patsy Dump 03	Patsy Dump 04	Clary Dump 06	Clary Dump 07	Patsy Dump 02	Patsy Dump 05	Clary Dump 08	Clary Dump 09	s582/1	s582/2	s582/3	s582/4	s594/1	s582/5	s582/6
			Intrusives	Intrusives	Intrusives	Intrusives	Intrusives	Hornfels	Hornfels	Hornfels	Hornfels	Pit Wall Samples	Pit Wall Samples	Pit Wall Samples	Pit Wall Samples	Pit Wall Samples	Pit Wall Samples	Pit Wall Samples	
Parameter	Method	Units																	
pH	meter		4.91	5.03	5.73	5.60	5.98	2.97	5.59	3.44	3.18	3.07	1.90	6.20	1.80	2.50	2.70	1.80	2.20
Redox	meter	mV	431	389	347	345	333	465	329	472	447	480							
Conductivity	meter	uS/cm	198	339	470	506	790	615	562	1040	760	1032							
Acidity (to pH 4.5)	titration	mg CaCO3/L	#N/A	#N/A	#N/A	#N/A	#N/A	74.3	#N/A	32.6	52.6	67.5							
Total Acidity (to pH 8.3)	titration	mg CaCO3/L	3275	152.7	80.3	83.8	16.0	318.1	31.0	72.4	90.6	105.5							
Alkalinity	titration	mg CaCO3/L	25.0	3.8	22.0	11.9	6.3	#N/A	8.7	#N/A	#N/A	#N/A							
Sulphate	Turbidity	mg/L	1	79	148	159	348	156	186	408	257	348							
<b>Ion Balance</b>																			
Major Anions	Calc	meq/L	#N/A	3.73	5.07	4.90	7.67	4.42	4.98	8.53	5.62	7.28							
Major Cations	Calc	meq/L	#N/A	2.98	4.65	4.77	7.48	3.97	4.86	8.84	5.11	7.06							
Difference	Calc	meq/L	#N/A	0.75	0.42	0.13	0.19	0.45	0.12	-0.30	0.51	0.23							
Balance (%)	Calc	%	#N/A	11.2%	4.3%	1.3%	1.2%	5.3%	1.2%	-1.8%	4.7%	1.6%							
<b>Dissolved Metals</b>																			
Hardness CaCO3		mg/L	21.4	40.5	116	127	262	30.3	135	284	103	174							
Aluminum Al	ICP-MS	mg/L	0.026	0.111	0.012	0.032	0.01	1.37	0.024	0.91	1.4	2.91							
Antimony Sb	ICP-MS	mg/L	0.0015	0.12	0.0073	0.0032	0.0092	0.00193	0.0018	0.0007	0.0007	0.00149							
Arsenic As	ICP-MS	mg/L	0.0004	0.0104	0.0067	0.0013	0.0008	0.00095	0.0144	0.0014	0.00518	0.00558							
Barium Ba	ICP-MS	mg/L	0.0007	0.0302	0.0163	0.0284	0.0386	0.125	0.0446	0.0938	0.104	0.125							
Beryllium Be	ICP-MS	mg/L	0.0002	0.00005	0.00005	0.00005	0.00005	0.00027	0.00005	0.00098	0.00044	0.00089							
Bismuth Bi	ICP-MS	mg/L	0.0001	0.00003	0.00003	0.00003	0.00003	0.000005	0.00003	0.00003	0.000005	0.000005							
Boron B	ICP-MS	mg/L	1	0.3	0.3	0.3	0.3	0.05	0.3	0.3	0.05	0.05							
Cadmium Cd	ICP-MS	mg/L	0.0001	0.0141	0.0033	0.00267	0.0368	0.0684	0.00177	0.266	0.0178	0.00967							
Calcium Ca	ICP-MS	mg/L	6.1	10.1	41.1	44.6	93.6	8.58	45.7	85.8	33.5	50.8							
Chromium Cr	ICP-MS	mg/L	0.02	0.0196	0.0286	0.0247	0.0291	0.034	0.0183	0.0062	0.018	0.0197							
Cobalt Co	ICP-MS	mg/L	0.0001	0.00391	0.00767	0.012	0.0178	0.0106	0.027	0.0798	0.093	0.109							
Copper Cu	ICP-MS	mg/L	0.005	0.0281	0.0052	0.0043	0.006	0.0377	0.0115	0.394	0.255	0.558							
Iron Fe	ICP-MS	mg/L	0.02	0.021	0.007	0.015	0.005	0.133	0.009	0.473	0.081	0.937							
Lead Pb	ICP-MS	mg/L	0.0003	0.0005	0.0002	0.00026	0.00021	0.0192	0.00115	0.0323	0.0246	0.0105							
Lithium Li	ICP-MS	mg/L	0.01	0.004	0.007	0.007	0.005	0.004	0.012	0.006	0.0171	0.0164							
Magnesium Mg	ICP-MS	mg/L	1.5	3.71	3.35	3.8	6.99	2.16	5.11	16.9	4.76	11.5							
Manganese Mn	ICP-MS	mg/L	0.001	0.462	0.438	0.586	1.89	0.0857	1.58	7.79	2.21	3.5							
Mercury Hg	CVAA	ug/L	0.2	0.09	0.05	0.05	0.05	0.01	0.05	0.05	0.01	0.01							
Molybdenum Mo	ICP-MS	mg/L	0.009	1.27	4.41	2.58	4.41	1.82	0.403	1.18	0.42	0.367							
Nickel Ni	ICP-MS	mg/L	0.007	0.0093	0.0218	0.0179	0.0153	0.0119	0.114	0.104	0.228	0.271							
Phosphorus P	ICP-MS	mg/L	35.1	20.7	16	13.9	3	12.1	9.64	0.326	2.73	0.344							
Potassium K	ICP-MS	mg/L	0.9	6.48	5.3	6.47	6	7.44	6.45	6.37	6.47	8.57							
Selenium Se	ICP-MS	mg/L	0.0008	0.004	0.0043	0.0021	0.0037	0.00317	0.0093	0.0085	0.00832	0.0105							
Silicon Si	ICP-MS	mg/L	2	6.8	9.57	9.05	9.15	6.35	8.8	9.4	6.89	11.6							
Silver Ag	ICP-MS	mg/L	0.0001	0.0247	0.00913	0.00237	0.00347	0.0218	0.00264	0.00803	0.00874	0.00293							
Sodium Na	ICP-MS	mg/L	48.5	43.1	43.6	43.2	42.9	42.8	44.7	44.4	44.9								
Strontium Sr	ICP-MS	mg/L	0.023	0.0885	0.117	0.195	0.358	0.0959	0.154	0.392	0.113	0.307							
Sulphur (S)	ICP-MS	mg/L	10	28	48	52	104	54	67	148	78	118							
Thallium Tl	ICP-MS	mg/L	0.00004	0.00009	0.00009	0.00006	0.0001	0.000164	0.00011	0.0004	0.000296	0.000478							
Tin Sn	ICP-MS	mg/L	0.743	0.00127	0.00017	0.00014	0.00005	0.00016	0.00026	0.00008	0.00007	0.00082							
Titanium Ti	ICP-MS	mg/L	0.01	0.074	0.015	0.008	0.003	0.0252	0.006	0.003	0.021	0.0006							
Uranium U	ICP-MS	mg/L	0.00017	0.00107	0.00101	0.00198	0.00002	0.000652	0.00022	0.00126	0.000394	0.00106							
Vanadium V	ICP-MS	mg/L	0.004	0.02	0.015	0.018	0.019	0.0143	0.023	0.001	0.0364	0.0054							
Zinc Zn	ICP-MS	mg/L	0.006	0.354	0.0482	0.0426	0.848	2.01	0.0226	7.61	0.592	0.373							
Zirconium Zr	ICP-MS	mg/L	0.002	0.0005	0.0005	0.0005	0.0005	0.0001	0.0005	0.0005	0.0001	0.0001							

**Notes:**  
 Brown italics = less than detection limit, detection limit shown.  
 Sample Weight = 2.50 g  
 NAG Solution = 250 mL of 17.5% H2O2 adjusted to pH 5.29 with 1N NaOH.  
 1 BC Approved and Working Guidelines for Freshwater Aquatic Life  
 F=for H greater than 50; Al=pH greater than 5; Ni for H 60 to 120 mg/L; criterion for Cd, Cu, Mn, Pb and Zn calculated for H 50-100 mg/L

Appendix E6. Weathered Waste Rock Shake Flask Leach Extraction Tests (SFE) - Concentrations

24 Hour Nanopure Water Leach Extraction Test at 3:1 Liquid to Solid Ratio

Sample ID		Blank	Clary Dump 06 (intrusives) Sequence 1	Clary Dump 07 (intrusives) Sequence 1	Clary Dump 08 (hornfels) Sequence 1	Clary Dump 09 (hornfels) Sequence 1	Patsy Dump 01 (intrusives) Sequence 1	Patsy Dump 02 (hornfels) Sequence 1	Patsy Dump 03 (intrusives) Sequence 1	Patsy Dump 04 (intrusives) Sequence 1	Patsy Dump 05 (hornfels) Sequence 1	K09-15AGT 0-4 Patsy Dump	K09-15AGT 4-9 Patsy Dump	K09-15AGT 9-14 Patsy Dump	K09-15AGT 14-19 Patsy Dump	K09-15AGT 19-24 Patsy Dump	K09-15AGT 24-29 Patsy Dump	K09-15AGT 29-34 Patsy Dump	K09-15AGT 34-39 Patsy Dump	K09-15AGT 39-44 Patsy Dump	K09-15AGT 44-49 Patsy Dump	K09-15AGT 49-54 Patsy Dump	K09-15AGT 55-59 Patsy Dump	K09-15GT 5-10 Patsy Dump	K09-15GT 10-15 Patsy Dump	K09-15GT 22-24 Patsy Dump	K09-15GT 24-29 Patsy Dump	K09-15GT 29-34 Patsy Dump	K09-15GT 34-39 Patsy Dump	K09-15GT 39-44 Patsy Dump	K09-15GT 44-47 Patsy Dump	K09-15GT slough Patsy Dump	
Volume Nanopure Water		mL	750	4.95	3.9	4.45	4.05	4.4	3.05	4.5	4.05	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Sample Weight		g	-	4.5	3.5	4.3	3.8	4	2.9	4	3.6	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
pH	meter		6.21	8	4.08	3.91	4.54	4.04	7.43	7.89	7.96	7.73	7.81	7.57	6.54	4.85	7.40	7.64	7.58	7.47	7.67	7.66	6.60	7.66	7.67	7.86	8.00	8.08	7.94	7.29	5.71	7.03	
Redox	meter	mV	379	347	486	482	446	491	353	344	482	318	330	334	325	240	185	221	256	288	384	360	357	325	387	292	364	361	362	367	234	245	
Conductivity	meter	uS/cm	<1	158	192	222	288	149	140	177	153	128	133	100	128	501	235	198	193	216	417	553	409	156	128	143	135	166	134	349	231	290	
Acidity (to pH 4.5)	titration	mg CaCO3/L	#N/A	#N/A	6.53	8.23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total Acidity (to pH 8.3)	titration	mg CaCO3/L	2.4	2.0	25.4	27.0	12.4	30.0	3.0	4.0	2.3	2.1	3.5	3.1	3.0	4.8	74.8	5.4	4.6	4.5	4.6	3.2	3.5	6.8	3.3	2.9	2.6	1.6	1.2	1.6	2.4	15.2	2.7
Alkalinity	titration	mg CaCO3/L	0.6	74.3	#N/A	#N/A	0.1	#N/A	41.4	78.2	68.7	56.5	58.7	37.4	27.1	30.8	56.6	71.8	48.0	51.8	47.3	8.9	57.9	30.4	67.4	64.9	72.2	51.7	15.3	2.1	9.1		
Chloride		mg/L	0.5	0.8	0.5	1.4	0.5	0.9	2.2	0.5	0.5	0.5	0.5	0.6	1.3	1.4	0.9	0.6	0.5	0.5	0.5	2.5	0.5	0.5	3.2	0.9	0.7	0.7	3	6.3	8		
Fluoride		mg/L	0.01	2.51	1.81	0.01	0.16	3.67	0.14	1.16	0.19	0.48	0.64	0.41	0.44	0.54	0.87	1.43	2.36	2.85	1.75	1.98	0.4	0.76	1.57	0.95	0.55	0.85	1.37	1.65	0.21	0.72	
Sulphate	Turbidity	mg/L	1	15	69	86	122	48	23	22	14	13	11	8	7	24	30	24	21	31	50	146	262	174	14	22	11	9	16	16	156	95	134
<b>Ion Balance</b>																																	
Major Anions	Calc	meq/L	#N/A	1.95	1.53	1.85	2.55	1.22	1.38	2.11	1.73	1.41	1.39	1.37	0.93	1.10	1.31	1.70	1.97	2.00	2.15	4.17	6.51	3.89	1.49	1.24	1.65	1.53	1.84	1.46	3.73	2.21	3.24
Major Cations	Calc	meq/L	#N/A	1.94	1.43	1.68	1.91	1.02	1.43	1.91	1.75	1.32	1.87	1.35	1.46	1.05	1.51	1.61	2.65	2.15	2.07	2.26	4.47	6.12	4.33	1.69	1.60	1.56	1.50	1.89	1.54	3.94	2.82
Difference	Calc	meq/L	#N/A	0.01	0.10	0.17	-0.32	0.20	-0.06	0.20	-0.02	0.09	0.04	-0.08	-0.12	-0.41	-4.86	-0.95	-0.18	-0.07	-0.11	-0.30	0.39	-0.44	-0.20	-0.36	0.09	0.03	-0.05	-0.07	-0.22	-0.11	0.42
Balance (%)	Calc	%	#N/A	0.3%	3.5%	4.7%	-6.0%	8.7%	-2.0%	4.9%	-0.6%	3.3%	-2.8%	-5.9%	-15.6%	-65.0%	-21.8%	-4.4%	-1.6%	-2.5%	-3.5%	3.1%	-5.3%	-6.4%	-12.6%	2.8%	1.0%	-1.3%	-2.4%	-2.8%	-2.5%	6.9%	
<b>Dissolved Metals</b>																																	
Hardness CaCO3		mg/L	0.5	87	45.4	56.2	115	25.2	68.5	82	74.8	59.4	60.3	61.4	44	44.4	227	117	92.9	92.1	104	211	289	199	73.7	56.1	67.7	64.5	75.2	181	89.1	129	
Aluminum Al	ICP-MS	mg/L	0.0005	0.0053	2.01	1.96	0.569	2.55	0.0234	0.011	0.008	0.0199	0.0174	0.0088	0.042	0.906	0.006	0.019	0.0238	0.0369	0.0185	0.0118	0.191	0.017	0.029	0.02	0.014	0.013	0.018	0.015	0.249	0.0062	
Antimony Sb	ICP-MS	mg/L	0.0002	0.00498	0.0001	0.00002	0.00005	0.00156	0.0032	0.0022	0.0021	0.00172	0.00037	0.00071	0.00028	0.0009	0.0011	0.0017	0.0011	0.00241	0.00175	0.00094	0.00129	0.00026	0.0006	0.001	0.0015	0.0012	0.0008	0.0006	0.0002	0.00005	
Arsenic As	ICP-MS	mg/L	0.0002	0.00009	0.00116	0.00034	0.00212	0.00144	0.00033	0.0002	0.0001	0.00028	0.00044	0.0001	0.00038	0.0001	0.0005	0.0001	0.0001	0.00015	0.00026	0.00012	0.00017	0.00075	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium Ba	ICP-MS	mg/L	0.00007	0.138	0.0426	0.0573	0.0508	0.0402	0.0349	0.113	0.121	0.0694	0.109	0.104	0.0205	0.0508	0.0493	0.0307	0.0733	0.0499	0.0277	0.0321	0.032	0.0245	0.0515	0.0183	0.0291	0.0865	0.0829	0.0452	0.0322	0.0701	0.0435
Beryllium Be	ICP-MS	mg/L	0.0001	0.0001	0.00023	0.00074	0.00093	0.00026	0.0001	0.00005	0.00003	0.00001	0.00001	0.00001	0.00001	0.00005	0.00006	0.00005	0.00005	0.00005	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Bismuth Bi	ICP-MS	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00003	0.00003	0.00003	0.00005	0.00005	0.00005	0.00003	0.00003	0.00003	0.00003	0.00003	0.000024	0.000034	0.00005	0.00005	0.000046	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00005
Boron B	ICP-MS	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.3	0.3	0.05	0.05	0.05	0.3	0.3	0.3	0.3	0.3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.3	0.3	0.3	0.3	0.3	0.05	0.05
Cadmium Cd	ICP-MS	mg/L	0.00005	0.00104	0.0112	0.022	0.0583	0.00577	0.00107	0.00127	0.00139	0.000601	0.000195	0.000622	0.000189	0.00267	0.0706	0.00247	0.00098	0.00262	0.00183	0.00207	0.00285	0.00104	0.00054	0.00239	0.00085	0.00146	0.00177	0.00114	0.00572	0.00101	0.000555
Calcium Ca	ICP-MS	mg/L	0.05	22.9	13.7	17.5	36.8	8.63	24.9	25.2	24.4	18.2	21.5	19.1	12.5	12.3	74.9	31.6	25.4	26.5	31.8	68	91.1	58.2	23.6	17.7	21.3	20.5	20.8	19.8	56.5	26.3	41.6
Chromium Cr	ICP-MS	mg/L	0.001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0005	0.0005	0.0001	0.0002	0.0001	0.0005	0.0001	0.0005	0.0041	0.0005	0.0001	0.0003	0.0001	0.0001	0.0023	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0001
Cobalt Co	ICP-MS	mg/L	0.00005	0.00018	0.00476	0.033	0.0368	0.00306	0.00018	0.00007	0.00013	0.00018	0.000135	0.000367	0.000331	0.0106	0.0817	0.00115	0.00022	0.000198	0.000185	0.000238	0.000303	0.00174	0.00009	0.00008	0.00007	0.00007	0.00008	0.00034	0.00589	0.0355	0.0123
Copper Cu	ICP-MS	mg/L	0.00039	0.00144	0.0335	0.01782	0.123	0.0642	0.00193	0.0042	0.0019	0.00282	0.00191	0.00217	0.0107	0.454	13.2	0.0289	0.0055	0.0058	0.0235	0.0147	0.0151	0.0166	0.0048	0.0113	0.0084	0.002	0.0035	0.005	0.0107	0.0151	0.00106
Iron Fe	ICP-MS	mg/L	0.001	0.003	0.155	0.054	0.067	0.064	0.006	0.038	0.01	0.003	0.007	0.008	0.007	0.014	0.377	0.006	0.011	0.022	0.007	0.005	0.025	0.006	0.006	0.021	0.005	0.005	0.008	0.023	4.45	0.082	
Lead Pb	ICP-MS	mg/L	0.00009	0.000651	0.0132	0.14	0.00919	0.021	0.00015	0.00006	0.00003	0.000045	0.000026	0.00005	0.000022	0.00006	0.00259	0.0002	0.00029	0.00039	0.0001	0.000093	0.00009	0.000093	0.00009	0.00011	0.00007	0.00007	0.00011	0.00007	0.00022	0.000148	0.000085
Lithium Li	ICP-MS	mg/L	0.005	0.005	0.0026	0.0097	0.0207	0.0027	0.0011	0.003	0.003	0.0016	0.002	0.0009	0.0012	0.01	0.018	0.006	0.005	0.0003	0.0005	0.0009	0.0014	0.0005	0.003	0.003	0.003	0.003	0.003	0.004	0.0042	0.0037	
Magnesium Mg	ICP-MS	mg/L	0.05	7.24	2.75	3.05	5.53	0.88	1.53	4.67	3.39	3.38	1.6	3.34	3.11	3.33	9.71	9.36	7.15	6.32	5.99	10.1	15.1	13	3.63	2.89	3.54	3.25	5.65	3.81	9.83	5.67	6.02
Manganese Mn	ICP-MS	mg/L	0.00006	0.00205	0.																												

Appendix E7. Sequential Meteoric Water Mobility Procedure

Sample ID			Patsy Dump 01 Sequence 1	Patsy Dump 01 Sequence 2	Patsy Dump 01 Sequence 3	Patsy Dump 01 Sequence 4	Patsy Dump 01 Sequence 5	Patsy Dump 01 Sequence 6	Patsy Dump 01 Sequence 7	Patsy Dump 02 Sequence 1	Patsy Dump 02 Sequence 2	Patsy Dump 02 Sequence 3	Patsy Dump 02 Sequence 4	Patsy Dump 02 Sequence 5	Patsy Dump 02 Sequence 6	Patsy Dump 02 Sequence 7	Patsy Dump 03 Sequence 1	Patsy Dump 03 Sequence 2	Patsy Dump 03 Sequence 3	Patsy Dump 03 Sequence 4	Patsy Dump 03 Sequence 5	Patsy Dump 04 Sequence 1	Patsy Dump 04 Sequence 2	Patsy Dump 04 Sequence 3
<b>Parameter</b>	<b>Method</b>	<b>Units</b>																						
Initial Sample Wt		kg	4.00	3.47	2.98	2.55	2.16	1.81	1.49	2.90	2.25	2.04	1.83	1.63	1.44	1.25	4.00	3.35	2.78	2.29	1.86	3.60	3.00	2.48
Input Volume		mL	4.40	4.12	3.35	3.00	2.40	2.02	1.70	3.05	2.70	2.45	2.20	1.72	1.63	1.40	4.50	3.85	3.30	2.90	2.15	4.05	3.45	2.90
Output Volume		mL	4.00	3.50	3.15	2.90	2.20	1.85	1.55	2.60	2.35	2.15	1.60	1.45	1.25	4.00	3.45	3.05	2.75	2.05	3.60	3.05	2.65	2.65
Sample Wet Wt. After Extraction	gravimetric	kg	4.35	3.65	3.10	2.75	2.30	2.00	1.65	3.05	2.35	2.05	1.95	1.70	1.95	1.40	4.45	3.70	3.05	2.50	2.05	3.95	3.30	2.75
Sample Dry Wt. After Extraction*		kg	3.95	3.50	2.95	2.55	2.15	1.80	1.50	2.90	2.25	2.00	1.85	1.60	1.40	1.25	3.95	3.35	2.75	2.30	1.85	3.55	3.00	2.45
pH	meter	mV	4.04	3.97	3.87	3.83	3.50	3.71	4.05	7.43	7.70	7.82	7.63	7.41	7.58	7.49	7.89	8.07	8.19	7.98	7.83	7.96	8.08	8.19
Redox	meter	uS/cm	491	457	442	458	463	505	442	353	321	329	330	334	347	298	346	316	327	322	323	344	316	332
Conductivity	meter	mg CaCO3/L	149	201	213	235	260	261	244	140	250	266	330	381	415	269	474	177	255	225	269	153	225	224
Acidity (to pH 4.5)	titration	mg CaCO3/L	7.1	8.4	9.4	12.9	17.1	15.2	8.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total Acidity (to pH 8.3)	titration	mg CaCO3/L	30.0	37.0	40.5	50.4	59.4	77.6	68.9	3.0	2.8	2.1	7.4	7.1	7.4	10.4	4.0	2.0	1.1	6.8	6.0	2.3	1.7	1.1
Alkalinity	titration	mg CaCO3/L	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	41.4	62.6	67.1	71.2	67.3	73.7	77.6	95.0	96.7	93.0	89.3	68.7	83.1	84.5	84.5
Chloride		mg/L	0.9	1.2	2.9	1.2	0.9	1.7	2.8	3.6	2.8	3.2	3.4	3	4.1	0.8	1	0.6	0.9	0.9	0.5	1.2	1.3	1.3
Fluoride		mg/L	3.67	4.72	5.96	6.82	7.81	8.82	10.1	0.14	0.39	0.3	0.31	0.31	0.51	0.26	1.62	1.81	1.76	1.69	1.16	1.6	1.4	1.4
Sulphate	Turbidity	mg/L	48	57	63	76	85	102	110	23	38	60	84	118	150	201	22	39	42	49	50	28	28	33
<b>Ion Balance</b>																								
Major Anions	calc.	meq/L	1.22	1.47	1.71	1.98	2.22	2.61	2.87	1.38	2.14	2.71	3.28	3.92	4.71	5.87	2.11	2.83	2.93	2.99	2.94	1.73	2.36	2.49
Major Cations	calc.	meq/L	1.02	1.29	1.45	1.71	2.08	2.40	2.41	1.43	2.39	2.45	3.11	3.84	4.73	6.01	1.91	2.59	2.68	2.95	2.97	1.75	2.42	2.46
Difference	calc.	meq/L	0.20	0.18	0.26	0.26	0.14	0.22	0.46	-0.06	-0.24	0.26	0.17	0.08	-0.02	-0.14	0.20	0.24	0.25	0.04	-0.03	-0.02	-0.06	0.03
Diff. (%)	calc.	meq/L	8.7%	6.7%	8.3%	7.1%	3.3%	4.4%	8.7%	-2.0%	-5.4%	5.1%	2.7%	1.0%	-0.2%	-1.2%	4.9%	4.4%	4.5%	0.6%	-0.5%	-0.6%	-1.3%	0.6%
<b>Dissolved Metals</b>																								
Hardness CaCO3		mg/L	25.2	31.7	33.6	40.4	46.4	58.5	60.5	68.5	113	117	148	183	226	289	82	112	116	129	129	74.8	104	105
Aluminum Al	ICP-MS	mg/L	2.55	3.28	3.82	4.7	5.14	6.37	6.95	0.0234	0.0134	0.016	0.01	0.0072	0.0108	0.0078	0.011	0.01	0.01	0.007	0.007	0.008	0.01	0.01
Antimony Sb	ICP-MS	mg/L	0.00156	0.00174	0.0021	0.002	0.0019	0.00184	0.0019	0.00032	0.0005	0.0007	0.0007	0.00049	0.00036	0.00036	0.0022	0.0026	0.0025	0.0028	0.0026	0.0021	0.0023	0.0026
Arsenic As	ICP-MS	mg/L	0.00144	0.00142	0.0018	0.0031	0.0019	0.0014	0.0032	0.0004	0.0004	0.00032	0.0008	0.00046	0.00061	0.00054	0.0002	0.0002	0.0001	0.0006	0.0002	0.001	0.0002	0.0004
Barium Ba	ICP-MS	mg/L	0.0402	0.0435	0.0404	0.038	0.0375	0.0388	0.046	0.0349	0.0582	0.0595	0.0611	0.0641	0.0551	0.0645	0.113	0.111	0.103	0.0966	0.103	0.121	0.119	0.106
Beryllium Be	ICP-MS	mg/L	0.00026	0.00031	0.0005	0.0004	0.0006	0.00054	0.00066	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0005	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0002
Bismuth Bi	ICP-MS	mg/L	0.00005	0.00005	0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.00005	0.00005	0.0001
Boron B	ICP-MS	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium Cd	ICP-MS	mg/L	0.00577	0.00691	0.0097	0.0103	0.0126	0.0159	0.0159	0.000107	0.000117	0.0001	0.00008	0.000165	0.000172	0.000167	0.00127	0.00111	0.00141	0.0011	0.00139	0.00139	0.00121	0.0013
Calcium Ca	ICP-MS	mg/L	8.63	10.9	11.4	13.7	15.8	20	20.6	24.9	41.1	41.8	53	65.8	81.1	103	25.2	34.8	35	39.5	39.8	24.4	34.6	34.2
Chromium Cr	ICP-MS	mg/L	0.0001	0.0002	0.0002	0.0002	0.0001	0.0003	0.0005	0.0001	0.0002	0.0001	0.0001	0.0001	0.0004	0.0004	0.0005	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0002
Cobalt Co	ICP-MS	mg/L	0.00306	0.00379	0.0044	0.0048	0.00551	0.00665	0.00679	0.000018	0.000024	0.0001	0.00005	0.000041	0.000065	0.000063	0.00007	0.00003	0.00005	0.0001	0.00004	0.00013	0.00003	0.0001
Copper Cu	ICP-MS	mg/L	0.0642	0.0786	0.117	0.117	0.142	0.161	0.161	0.00193	0.00351	0.008	0.0054	0.00218	0.00439	0.00403	0.0042	0.003	0.003	0.0017	0.0019	0.003	0.003	0.005
Iron Fe	ICP-MS	mg/L	0.064	0.075	0.087	0.095	0.09	0.104	0.113	0.006	0.004	0.02	0.01	0.03	0.006	0.004	0.038	0.013	0.005	0.02	0.006	0.01	0.006	0.02
Lead Pb	ICP-MS	mg/L	0.021	0.0156	0.0078	0.0086	0.00868	0.00949	0.0136	0.000015	0.000024	0.0003	0.00035	0.000006	0.000024	0.000037	0.00006	0.00005	0.00008	0.0002	0.00006	0.00003	0.00003	0.0003
Lithium Li	ICP-MS	mg/L	0.0027	0.0035	0.01	0.01	0.006	0.0061	0.007	0.0011	0.0021	0.01	0.005	0.0029	0.0028	0.0034	0.003	0.005	0.005	0.01	0.005	0.003	0.004	0.01
Magnesium Mg	ICP-MS	mg/L	0.88	1.09	1.3	1.5	2.08	2.2	2.63	1.53	2.63	3	3.88	4.61	5.69	7.46	4.67	6.11	7.03	7.3	7.31	3.39	4.33	4.8
Manganese Mn	ICP-MS	mg/L	0.128	0.165	0.179	0.224	0.24	0.291	0.302	0.00027	0.0003	0.002	0.0011	0.00027	0.00286	0.00033	0.0025	0.0044	0.0067	0.005	0.003	0.0007	0.0004	0.001
Mercury Hg	CVAA	ug/L	0.06	0.04	0.2	0.2	0.06	0.05	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2
Molybdenum Mo	ICP-MS	mg/L	0.00354	0.00475	0.006	0.004	0.0102	0.00571	0.0052	0.111	0.173	0.155	0.161	0.166	0.145	0.128	1.82	2.25	2.35	2.56	2.56	2.04	2.76	2.97
Nickel Ni	ICP-MS	mg/L	0.00217	0.0082	0.0061	0.0083	0.0052	0.0066	0.0063	0.00083	0.0008	0.0033	0.00121	0.00122	0.00171	0.0024	0.0007	0.003	0.0064	0.0024	0.0018	0.0003	0.0062	0.0062
Phosphorus P	ICP-MS	mg/L	0.061	0.063	0.04	0.069	0.044	0.065	0.06	0.003	0.002	0.004	0.02	0.004	0.007	0.003	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04
Potassium K	ICP-MS	mg/L	3.24	3.94	4	4.5	4.98	6.13	6.06	1.78	3.4	4.36	5.29	6.26	7.13	4.99	6.55	6.12	6.8	6.77	3.29	4.23	4.1	4.1
Selenium Se	ICP-MS	mg/L	0.00034	0.00027	0.0008	0.0008	0.0004	0.00033	0.0003	0.00037	0.00075	0.001	0.0013	0.00177	0.00199	0.00294	0.0003	0.0004	0.0005	0.0008	0.0007	0.0002	0.0002	0.0008
Silicon Si	ICP-MS	mg/L	4.36	6.49	9.12	11.5	13	15.3	16.5	0.518	0.877	2	1.14	1.12	1.22	1.01	1.35	1.4	1.33	1.23	1.23	1.57	2	2
Silver Ag	ICP-MS	mg/L	0.000019	0.00001	0.0001	0.0001	0.00008	0.00009	0.00006	0.00005	0.00005	0.0001	0.00008	0.000019	0.000012	0.00005	0.00003	0.00004	0.00003	0.00001	0.00003	0.00003	0.00003	0.0001
Sodium Na	ICP-MS	mg/L	1.06	1.37	1.9	2.1	2.44	3.06	3.36	0.23	0.43	0.6	0.65	0.78	1.01	1.41	0.46	0.82	0.91	0.93	0.64	1.06	1.2	1.2
Strontium Sr	ICP-MS	mg/L	0.0644	0.0792	0.09	0.11	0.117	0.142	0.145	0.1	0.174	0.189	0.233	0.31	0.408	0.237	0.322	0.336	0.363	0.347	0.492	0.66	0.679	0.679
Sulphur (S)	ICP-MS	mg/L	14	18	10	23	25	32	32	7	16	10	27	38	48	72	12	12	12	18	18	10	10	10
Thallium Tl	ICP-MS	mg/L	0.000076	0.000092	0.0001	0.00009	0.0001	0.000126	0.00012	0.000023	0.000043	0.00005	0.00005	0.00005	0.000049</									

Appendix E7. Sequential Meteoric Water Mobility Pr

Sample ID			Patsy Dump 04 Sequence 4	Patsy Dump 04 Sequence 5	Patsy Dump 04 Sequence 6	Patsy Dump 04 Sequence 7	Patsy Dump 05 Sequence 1	Patsy Dump 05 Sequence 2	Patsy Dump 05 Sequence 3	Patsy Dump 05 Sequence 4	Patsy Dump 05 Sequence 5	Clary Dump 06 Sequence 1	Clary Dump 06 Sequence 2	Clary Dump 06 Sequence 3	Clary Dump 06 Sequence 4	Clary Dump 06 Sequence 5	Clary Dump 06 Sequence 6	Clary Dump 06 Sequence 7	Clary Dump 07 Sequence 1	Clary Dump 07 Sequence 2	Clary Dump 07 Sequence 3	Clary Dump 07 Sequence 4	Clary Dump 07 Sequence 5	Clary Dump 07 Sequence 6
Parameter	Method	Units																						
Initial Sample Wt		kg	2.03	1.63	1.29	0.99	4.00	3.30	2.96	2.64	2.34	4.50	3.92	3.39	2.91	2.49	2.10	1.76	3.50	2.98	2.52	2.11	1.74	1.42
Input Volume		mL	2.50	1.88	1.48	1.15	4.25	3.61	3.20	2.85	2.49	4.95	4.35	3.75	3.35	2.76	2.40	2.00	3.90	3.35	2.85	2.40	1.96	1.62
Output Volume		mL	2.35	1.30	1.00	0.70	4.00	3.35	3.00	2.70	2.35	4.50	3.90	3.50	3.15	2.50	2.15	1.75	3.50	3.00	2.55	2.30	1.80	1.45
Sample Wet Wt. After Extraction	gravimetric	kg	2.30	1.85	1.45	1.20	4.20	3.60	3.15	2.80	2.50	4.85	4.40	3.65	3.25	2.85	2.40	2.10	3.90	3.25	2.80	2.25	1.90	1.60
Sample Dry Wt. After Extraction*		kg	2.05	1.60	1.25	1.00	3.95	3.35	3.00	2.70	2.30	4.40	3.95	3.40	2.95	2.50	2.05	1.80	3.50	2.95	2.55	2.15	1.75	1.40
pH	meter	mV	7.99	7.90	7.90	7.78	7.91	8.14	8.25	8.04	7.92	8.00	8.21	8.30	8.10	8.01	8.01	7.93	4.08	4.28	4.16	4.11	3.94	4.04
Redox	meter	mV	325	318	342	292	347	319	335	329	315	347	316	335	327	312	338	291	486	457	465	467	431	480
Conductivity	meter	uS/cm	251	270	263	244	263	246	276	276	246	158	247	240	262	278	267	249	192	278	275	296	312	305
Acidity (to pH 4.5)	titration	mg CaCO3/L	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.5	5.0	6.6	9.7	12.9	19.2
Total Acidity (to pH 8.3)	titration	mg CaCO3/L	6.1	5.7	7.2	8.4	2.1	1.5	0.8	5.3	2.0	1.4	0.6	5.6	5.6	6.9	7.5	25.4	28.9	32.8	35.5	42.3	55.3	55.3
Alkalinity	titration	mg CaCO3/L	83.0	79.9	84.6	86.9	90.0	91.6	90.8	86.7	74.3	102.5	104.4	101.3	100.2	102.6	109.4	109.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Chloride		mg/L	1.4	1.5	1.2	1.7	0.5	0.6	0.5	0.5	0.8	1.4	1.3	1.2	1.7	1.1	1.1	1.4	0.5	0.7	0.6	0.6	1	0.5
Fluoride		mg/L	1.37	1.33	1.31	1.27	0.19	0.29	0.33	0.31	0.29	2.51	3.15	3.18	3.17	3.03	3.12	3.07	1.81	2.48	2.79	3.02	3.08	3.72
Sulphate	Turbidity	mg/L	48	54	55	68	13	47	62	62	61	15	26	27	37	39	46	51	69	90	108	126	112	135
<b>Ion Balance</b>																								
Major Anions	calc.	meq/L	2.77	2.84	2.94	3.27	1.41	2.58	2.83	3.12	3.02	1.95	2.80	2.85	3.00	3.02	3.20	3.45	1.53	2.03	2.41	2.80	2.52	3.01
Major Cations	calc.	meq/L	2.78	2.91	3.27	3.24	1.32	2.49	2.64	2.74	2.91	1.94	2.73	2.72	2.84	3.01	3.17	3.35	1.43	1.77	2.18	2.29	2.53	2.73
Difference	calc.	meq/L	-0.01	-0.07	-0.33	0.03	0.09	0.09	0.19	0.38	0.11	0.01	0.07	0.14	0.16	0.01	0.03	0.10	0.10	0.26	0.23	0.51	-0.01	0.28
Diff. (%)	calc.	meq/L	-0.1%	-1.3%	-5.4%	0.5%	3.3%	1.8%	3.5%	6.5%	1.9%	0.3%	1.3%	2.4%	2.7%	0.2%	0.5%	1.4%	3.5%	6.9%	5.1%	10.0%	-0.1%	4.9%
<b>Dissolved Metals</b>																								
Hardness CaCO3		mg/L	119	125	142	141	59.4	113	120	125	133	87	123	123	129	137	145	153	45.4	58.6	70.8	75	81.1	89.7
Aluminum Al	ICP-MS	mg/L	0.008	0.008	0.005	0.005	0.0182	0.007	0.009	0.011	0.005	0.0053	0.006	0.008	0.007	0.005	0.003	0.005	2.01	2.51	3.19	3.33	3.58	3.76
Antimony Sb	ICP-MS	mg/L	0.0022	0.0021	0.0019	0.002	0.00172	0.0024	0.0023	0.0022	0.0021	0.00498	0.0053	0.0051	0.0052	0.0046	0.0047	0.0001	0.00009	0.00012	0.0001	0.00009	0.00011	0.00011
Arsenic As	ICP-MS	mg/L	0.0006	0.0002	0.0002	0.0001	0.00011	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium Ba	ICP-MS	mg/L	0.0906	0.0898	0.0835	0.0838	0.0694	0.099	0.0843	0.0763	0.0775	0.138	0.159	0.134	0.119	0.122	0.125	0.124	0.0426	0.0406	0.0363	0.0361	0.0375	0.0327
Beryllium Be	ICP-MS	mg/L	0.0001	0.00005	0.00005	0.00005	0.00001	0.00005	0.00005	0.0001	0.00005	0.00001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00023	0.00022	0.00025	0.0003	0.00036	0.00033
Bismuth Bi	ICP-MS	mg/L	0.00005	0.00003	0.00003	0.00003	0.00005	0.00003	0.00003	0.00003	0.00003	0.00005	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Boron B	ICP-MS	mg/L	0.5	0.3	0.3	0.3	0.5	0.3	0.3	0.5	0.3	0.05	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5
Cadmium Cd	ICP-MS	mg/L	0.00149	0.00171	0.00227	0.00138	0.000601	0.00059	0.00081	0.00054	0.00071	0.00104	0.00097	0.00108	0.00096	0.00101	0.00116	0.00083	0.0112	0.0124	0.0138	0.0163	0.0198	0.0191
Calcium Ca	ICP-MS	mg/L	39	40.8	46.6	46.2	18.2	34.5	35.2	37.5	39.7	22.9	33.1	31.2	33.6	35.5	38.4	40.3	13.7	17.7	21.3	22.5	24.7	27.2
Chromium Cr	ICP-MS	mg/L	0.001	0.0005	0.0005	0.0005	0.0001	0.0005	0.0005	0.0001	0.0005	0.0001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0001	0.0001	0.0003	0.0003	0.0002	0.0003
Cobalt Co	ICP-MS	mg/L	0.00005	0.00003	0.00003	0.00003	0.000018	0.00003	0.00003	0.00003	0.00003	0.000018	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00476	0.00498	0.00726	0.0072	0.00811	0.00834
Copper Cu	ICP-MS	mg/L	0.0087	0.0036	0.0029	0.003	0.00282	0.0022	0.0061	0.017	0.0023	0.00144	0.0032	0.0025	0.0081	0.0032	0.0041	0.0335	0.0044	0.0359	0.0428	0.136	0.0668	0.0553
Iron Fe	ICP-MS	mg/L	0.01	0.005	0.005	0.005	0.003	0.005	0.005	0.01	0.005	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.155	0.085	0.09	0.061	0.07	0.057
Lead Pb	ICP-MS	mg/L	0.00014	0.00003	0.0001	0.00003	0.000045	0.00003	0.0002	0.00012	0.00006	0.000651	0.00029	0.00027	0.00024	0.0002	0.00019	0.00017	0.0132	0.0106	0.0171	0.0212	0.0112	0.0128
Lithium Li	ICP-MS	mg/L	0.005	0.005	0.005	0.006	0.0016	0.003	0.004	0.005	0.004	0.005	0.009	0.01	0.011	0.012	0.011	0.013	0.0026	0.0036	0.0054	0.0057	0.0069	0.0074
Magnesium Mg	ICP-MS	mg/L	5.27	5.56	6.24	6.17	3.38	7.84	7.59	8.24	7.24	9.89	8.24	11	10.9	11.7	11.9	12.8	4.31	4.54	4.71	4.54	4.71	5.33
Manganese Mn	ICP-MS	mg/L	0.0016	0.0003	0.0007	0.0003	0.00126	0.0005	0.0003	0.0015	0.0003	0.00205	0.0044	0.0059	0.0085	0.0072	0.0053	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052	0.0052
Mercury Hg	CVAA	ug/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Molybdenum Mo	ICP-MS	mg/L	3.34	3.53	3.55	3.47	0.796	1.2	1.26	1.27	1.22	1.04	1.28	1.34	1.38	1.36	1.27	1.29	0.00005	0.00062	0.00051	0.00005	0.00071	0.00071
Nickel Ni	ICP-MS	mg/L	0.005	0.0022	0.002	0.0003	0.00031	0.0005	0.0015	0.0052	0.0014	0.00111	0.0005	0.0021	0.0026	0.0021	0.0026	0.0007	0.00262	0.00357	0.00419	0.00599	0.00471	0.00471
Phosphorus P	ICP-MS	mg/L	0.02	0.01	0.01	0.01	0.002	0.01	0.01	0.02	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.044	0.003	0.007	0.009	0.003	0.009
Potassium K	ICP-MS	mg/L	4.38	4.48	4.88	4.72	2.57	5.03	5.02	5.13	5.42	4.32	5.42	5.1	5.27	5.5	5.74	6.01	4.95	6.01	7.25	7.34	8.38	8.67
Selenium Se	ICP-MS	mg/L	0.0004	0.0004	0.0004	0.0004	0.00009	0.0002	0.0002	0.0004	0.0004	0.0002	0.0004	0.0003	0.0004	0.0005	0.0005	0.0006	0.00019	0.00015	0.00018	0.00017	0.00019	0.00019
Silicon Si	ICP-MS	mg/L	1.54	1.57	1.77	1.61	0.507	0.895	0.846	0.992	1.59	0.92	1.59	2.17	2.38	1.81	2.13	2.18	2.11	5.27	7.16	10.2	13.5	15.2
Silver Ag	ICP-MS	mg/L	0.00005	0.00003	0.00003	0.00003	0.00005	0.00003	0.00003	0.00005	0.00006	0.00005	0.00003	0.00003	0.00003	0.00005	0.00003	0.00003	0.00016	0.00001	0.00009	0.00007	0.000023	0.000041
Sodium Na	ICP-MS	mg/L	1.41	1.43	1.58	1.55	0.4	0.57	0.59	0.65	0.63	0.33	0.65	0.63	0.75	0.78	0.86	1.1	2.33	2.37	2.88	3.21	3.21	3.21
Strontium Sr	ICP-MS	mg/L	0.715	0.751	0.828	0.866	0.115	0.211	0.221	0.235	0.233	0.457	0.625	0.636	0.641	0.669	0.701	0.783	0.0844	0.104	0.13	0.138	0.151	0.151
Sulphur (S)	ICP-MS	mg/L	19	19	22	19	6	10	15	18	23	6	9	8	13	15	17	18	22	28	30	35	40	43
Thallium Tl	ICP-MS	mg/L	0.00005	0																				

Appendix E7. Sequential Meteoric Water Mobility Pr

Sample ID			Clary Dump 07 Sequence 7	Clary Dump 08 Sequence 1	Clary Dump 08 Sequence 2	Clary Dump 08 Sequence 3	Clary Dump 08 Sequence 4	Clary Dump 08 Sequence 5	Clary Dump 08 Sequence 6	Clary Dump 08 Sequence 7	Clary Dump 09 Sequence 1	Clary Dump 09 Sequence 2	Clary Dump 09 Sequence 3	Clary Dump 09 Sequence 4	Clary Dump 09 Sequence 5	Clary Dump 09 Sequence 6	Clary Dump 09 Sequence 7	Blank Sequence 7
<b>Parameter</b>	<b>Method</b>	<b>Units</b>																
Initial Sample Wt		kg	1.13	4.30	3.30	3.06	2.82	2.59	2.37	2.15	3.80	3.20	2.84	2.50	2.18	1.89	1.62	#N/A
Input Volume		mL	1.30	4.45	3.50	3.20	2.95	2.67	2.56	2.40	4.05	3.44	3.15	2.85	2.35	2.03	1.80	4.00
Output Volume		mL	1.15	4.30	3.35	3.10	2.95	2.60	2.40	2.15	3.80	3.25	3.00	2.75	2.30	1.95	1.60	4.1
Sample Wet Wt. After Extraction	gravimetric	kg	1.35	4.50	3.50	3.15	3.00	2.65	2.55	2.40	4.05	3.35	3.00	2.65	2.30	2.05	1.95	4.00
Sample Dry Wt. After Extraction*			1.15	4.25	3.35	3.00	2.85	2.55	2.35	2.20	3.75	3.20	2.85	2.50	2.20	1.85	1.65	#N/A
pH	meter		4.05	3.91	3.96	3.89	3.67	3.58	3.65	3.66	4.54	4.66	4.70	4.62	4.42	4.59	4.79	6.33
Redox	meter	mV	467	482	463	461	473	454	456	481	446	419	428	394	421	381	412	319
Conductivity	meter	uS/cm	278	222	408	486	662	723	832	930	674	441	481	602	674	733	799	0
Acidity (to pH 4.5)	titration	mg CaCO3/L	7.6	8.2	9.6	11.8	23.3	27.3	29.3	32.1	#N/A	#N/A	#N/A	2.3	2.8	2.9	2.1	#N/A
Total Acidity (to pH 8.3)	titration	mg CaCO3/L	43.8	27.0	39.7	54.6	85.7	95.5	128.8	177.1	12.4	12.9	15.3	26.0	26.4	34.7	45.3	5.6
Alkalinity	titration	mg CaCO3/L	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>	<i>0.1</i>	#N/A	<i>0.0</i>	0.7	3.6
Chloride		mg/L	0.9	2.3	2.3	3	3.4	4.3	5.3	0.7	<i>0.5</i>	<i>0.6</i>	<i>0.6</i>	0.9	<i>0.5</i>	1.4	<i>0.5</i>	0.01
Fluoride		mg/L	3.24	0.35	0.93	0.94	1.22	1.3	2	1.85	0.16	0.23	0.27	0.33	0.34	0.4	0.49	0.01
Sulphate	Turbidity	mg/L	134	86	187	232	331	341	463	615	122	211	235	307	350	415	435	<i>1</i>
<b>Ion Balance</b>																		
Major Anions	calc.	meq/L	2.99	1.85	4.01	4.95	7.04	7.27	9.87	13.06	2.55	4.41	4.90	6.43	7.33	8.67	9.14	#N/A
Major Cations	calc.	meq/L	2.68	1.68	3.27	4.19	6.08	6.84	8.73	11.68	2.87	4.02	4.49	5.81	6.49	8.19	8.92	#N/A
Difference	calc.	meq/L	0.31	0.17	0.74	0.76	0.97	0.43	1.14	1.38	-0.32	0.39	0.41	0.62	0.84	0.48	0.22	#N/A
Diff. (%)	calc.	meq/L	5.4%	4.7%	10.2%	8.3%	7.4%	3.1%	6.1%	5.6%	-6.0%	4.6%	4.4%	5.1%	6.1%	2.8%	1.2%	#N/A
<b>Dissolved Metals</b>																		
Hardness CaCO3		mg/L	85.8	56.2	117	144	206	230	306	419	115	167	185	240	270	343	374	<i>0.5</i>
Aluminum Al	ICP-MS	mg/L	4.06	1.96	3.47	5.16	8.03	9.26	10.9	14.1	0.569	0.604	0.655	0.898	0.966	1.28	1.67	0.0061
Antimony Sb	ICP-MS	mg/L	0.0001	<i>0.0002</i>	<i>0.0002</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.0001</i>	0.00005	0.00002	<i>0.0001</i>	0.0001	<i>0.0001</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.0002</i>
Arsenic As	ICP-MS	mg/L	0.00024	0.00054	0.0012	0.0023	0.0016	0.0018	0.0012	0.0021	0.0016	0.0018	0.0008	0.0011	0.0016	0.0009	0.0008	0.00004
Barium Ba	ICP-MS	mg/L	0.0361	0.0573	0.0652	0.0513	0.0457	0.0418	0.0361	0.03	0.0508	0.0445	0.0419	0.04	0.0404	0.0432	0.0372	0.00209
Beryllium Be	ICP-MS	mg/L	0.00041	0.00074	0.00131	0.00201	0.0027	0.00296	0.00313	0.00378	0.00093	0.00093	0.00122	0.00128	0.00133	0.00157	0.0017	<i>0.00001</i>
Bismuth Bi	ICP-MS	mg/L	<i>0.000005</i>	<i>0.000005</i>	<i>0.000005</i>	<i>0.000005</i>	<i>0.000003</i>	<i>0.000003</i>	<i>0.000003</i>	<i>0.000003</i>	<i>0.000005</i>	<i>0.000005</i>	<i>0.000003</i>	<i>0.000003</i>	<i>0.000003</i>	<i>0.000003</i>	<i>0.000003</i>	<i>0.000005</i>
Boron B	ICP-MS	mg/L	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	<i>0.3</i>	<i>0.3</i>	<i>0.3</i>	<i>0.3</i>	<i>0.3</i>	<i>0.05</i>	<i>0.05</i>	<i>0.3</i>	<i>0.3</i>	<i>0.3</i>	<i>0.3</i>	<i>0.3</i>	<i>0.05</i>
Cadmium Cd	ICP-MS	mg/L	0.0207	0.022	0.0461	0.0661	0.0871	0.103	0.126	0.166	0.0583	0.0748	0.0959	0.111	0.126	0.151	0.165	0.000037
Calcium Ca	ICP-MS	mg/L	26.2	17.5	36.8	44.2	62.8	70.3	94.8	129	36.8	53.6	58.3	75.4	85.1	109	117	<i>0.05</i>
Chromium Cr	ICP-MS	mg/L	<i>0.0001</i>	<i>0.0001</i>	0.0003	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	0.0002	0.0002	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0001</i>
Cobalt Co	ICP-MS	mg/L	0.00855	0.033	0.0619	0.101	0.156	0.171	0.201	0.261	0.0368	0.0441	0.0523	0.066	0.0703	0.0867	0.101	0.000014
Copper Cu	ICP-MS	mg/L	0.0479	0.0782	0.154	0.229	0.344	0.337	0.324	0.123	0.125	0.144	0.292	0.19	0.223	0.231	0.00209	0.00209
Iron Fe	ICP-MS	mg/L	0.076	0.054	0.064	0.445	0.298	0.262	0.172	0.166	0.067	0.019	0.025	0.031	0.024	0.034	0.032	0.004
Lead Pb	ICP-MS	mg/L	0.0156	0.14	0.248	0.338	0.386	0.425	0.429	0.446	0.00919	0.00605	0.0078	0.00731	0.00808	0.0101	0.0105	0.000218
Lithium Li	ICP-MS	mg/L	0.0086	0.0097	0.0209	0.027	0.037	0.041	0.049	0.065	0.0207	0.0305	0.033	0.038	0.042	0.046	0.05	<i>0.0005</i>
Magnesium Mg	ICP-MS	mg/L	4.95	3.05	6.13	8.13	11.9	13.3	16.9	23.2	5.53	8.01	9.63	12.7	14	17.5	19.7	<i>0.05</i>
Manganese Mn	ICP-MS	mg/L	0.901	3.68	7.3	10.6	15.6	17.2	21.9	29	6.96	9.71	11.6	14.7	15.9	19.4	21.5	0.00043
Mercury Hg	CVAA	ug/L	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	<i>0.01</i>	<i>0.01</i>	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	<i>0.05</i>	<i>0.01</i>
Molybdenum Mo	ICP-MS	mg/L	0.00027	<i>0.00005</i>	0.00045	0.0008	<i>0.0003</i>	0.0008	0.0012	0.0008	0.00008	0.00019	0.0006	<i>0.0003</i>	<i>0.0003</i>	0.0008	0.0006	<i>0.00005</i>
Nickel Ni	ICP-MS	mg/L	0.00486	0.0703	0.124	0.195	0.296	0.319	0.367	0.477	0.495	0.631	0.797	0.997	1.06	1.27	1.46	0.001
Phosphorus P	ICP-MS	mg/L	<i>0.02</i>	0.004	0.003	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	0.0005	0.0005	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>	<i>0.02</i>
Potassium K	ICP-MS	mg/L	8.38	1.2	2.29	2.53	3.18	4.47	5.42	4.86	4.78	4.71	5.87	6.46	7.78	7.49	7.49	<i>0.05</i>
Selenium Se	ICP-MS	mg/L	0.00018	0.00064	0.00114	0.0018	0.0022	0.0025	0.0031	0.0038	0.00119	0.00163	0.0022	0.0025	0.0029	0.0033	0.0038	<i>0.00004</i>
Silicon Si	ICP-MS	mg/L	15.1	2.31	5.09	6.49	8.65	9.81	12	13.5	4.76	7.71	9.22	10	11.4	10.7	10.7	<i>0.1</i>
Silver Ag	ICP-MS	mg/L	0.000014	0.000012	0.000017	0.0001	0.0001	0.00007	0.00004	0.00004	0.000016	0.000012	0.00004	0.00018	0.00005	0.00003	<i>0.00003</i>	0.000018
Sodium Na	ICP-MS	mg/L	3.45	0.47	1.06	1.21	1.65	1.81	2.19	3.04	1.11	1.04	1	1.38	1.46	1.74	2.11	0.09
Strontium Sr	ICP-MS	mg/L	0.158	0.0674	0.136	0.172	0.216	0.239	0.308	0.435	0.183	0.27	0.299	0.356	0.397	0.47	0.562	0.00013
Sulphur (S)	ICP-MS	mg/L	42	27	54	69	103	113	150	191	49	66	73	96	110	140	146	<i>3</i>
Thallium Tl	ICP-MS	mg/L	0.000201	0.00011	0.000222	0.00025	0.00032	0.00034	0.00038	0.00046	0.000177	0.000251	0.00025	0.00027	0.00029	0.00033	0.00034	<i>0.000002</i>
Tin Sn	ICP-MS	mg/L	0.00401	0.00253	0.00764	0.0119	0.0124	0.0159	0.0108	0.00753	0.00237	0.00421	0.00516	0.0019	0.00243	0.002	0.00167	0.00177
Titanium Ti	ICP-MS	mg/L	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.003</i>	<i>0.003</i>	<i>0.003</i>	<i>0.003</i>	<i>0.003</i>	<i>0.0008</i>	<i>0.0005</i>	<i>0.003</i>	0.004	0.008	0.004	<i>0.003</i>	<i>0.0005</i>
Uranium U	ICP-MS	mg/L	0.000373	0.000792	0.00148	0.00278	0.00306	0.00351	0.00364	0.00392	0.000938	0.00108	0.00155	0.00147	0.00167	0.00209	0.00221	<i>0.000002</i>
Vanadium V	ICP-MS	mg/L	<i>0.0002</i>	<i>0.0002</i>	<i>0.0002</i>	<i>0.001</i>	<i>0.001</i>	<i>0.001</i>	<i>0.001</i>	<i>0.001</i>	<i>0.0002</i>	<i>0.001</i>	<i>0.001</i>	<i>0.001</i>	<i>0.001</i>	<i>0.001</i>	<i>0.001</i>	<i>0.0002</i>
Zinc Zn	ICP-MS	mg/L	0.599	0.753	1.36	2.22	2.94	3.32	3.93	5.58	1.3	1.46	2.19	2.55	2.87	3.31	3.87	0.0022
Zirconium Zr	ICP-MS	mg/L	<i>0.0001</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0001</i>	0.0008	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0005</i>	<i>0.0001</i>