Department of Infrastructure, Energy and Resources
MINERAL RESOURCES TASMANIA

Enquiries: Ralph Bottrill
Ph: 03 6233 8359 Fax: 03 6233 8338
Email: ralph.bottrill@dier.tas.gov.au Web www.mrt.tas.gov.au
Our Ref: 10RSB007:DS 69231

31 August 2010

Shree Minerals Ltd.
14 Arundale Crescent
Wembley Downs, WA 6019

Attention: Mahendra Pal

Dear Sir

MRT MIN PET JOB M09081:
PETROLOGY, NELSON BAY RIVER DEPOSIT

Six rock samples from the above location were submitted by Wes Harder (Gujarat NRE Resources NL) for identification and petrology, specifically looking for information as to their nature and origin. They were prepared and analysed in the MRT laboratories, Hobart and Mornington, Tasmania, and the results are enclosed.

An invoice for $759.00 covering this work will be forwarded shortly.

6 thin sections @ $25 each	$150.00
6 microscopic descriptions @ $60 each	$360.00
6 photos @ $10 each	$60.00
2 hours compilation @ $60 per hour	$120.00
GST	$69.00
Total	$759.00

Yours sincerely

R S Bottrill
MINERALOGIST-PETROLOGIST

Encl.

Mineral Resources Tasmania
Department of Infrastructure, Energy and Resources

Tasmania
Explore the possibilities

Petrological and Mineralogical Analyses Nelson Bay River Prospect

A preliminary report

R S Bottrill

Mineral Resources Tasmania

31 August 2008

30 Gordons Hill Road PO Box 56 ROSNY PARK TAS 7018

Petrological and Mineralogical Analyses Nelson Bay River Prospect

MRT Mineralogical/Petrology Laboratory
Job No. M09081

R S Bottrill, 31 August 2010

Summary

The rocks collected from these drillholes are mostly complex iron formations (mixed carbonate-oxide-silicate), probably of metasomatic origin, and some probable mafic rocks, highly altered and of uncertain origin.

The ironstones contain siderite, magnetite, stilpnomelane, quartz and amphiboles (probably grunerite). Their origin is uncertain, but their medium to high temperature mineral assemblages and lack of strong foliation is suggestive of a Devonian origin, possible unusual iron skarns?

Introduction & Background

Six samples of rock were collected by Wes Harder from this prospect, mostly from drillcore, for petrological and mineralogical analysis as part of a study of the magnetite deposits. Two samples were collected by myself for comparison with other magnetite deposits in Tasmania, and were included here.

The sample details are: given in Table 1.

Table 1: Sample details

MRT No.	ID No.	Location	
C110617	NBR7/53.3	Nelson Bay R Pr	skarn
C110618	NBR7/55.3	Nelson Bay R Pr	volcanic?
C110619	NBR7/68.3	Nelson Bay R Pr	amphibolite?
C110620	NBR8/94.7	Nelson Bay R Pr	volcanic?
C110621	NBR8/95.5	Nelson Bay R Pr	siderite?
C110622	NBR8/105.1	Nelson Bay R Pr	skarn
C108983	NBR002/236.5	Nelson Bay R Pr	skarn
C108984	NBR002/236.9	Nelson Bay R Pr	skarn

The samples were examined by polarised light microscopy and some were checked by X-Ray Diffraction (XRD) in the MRT laboratories, Hobart.

Petrology

C110617; NBR7/53.3 Nelson Bay R Pr; mineralized skarn?

In hand specimen this rock is mottled off-white with coarse, fracture controlled and disseminated magnetite, forming a diffuse network in an indeterminate matrix with no veining or foliation.

In thin section this sample is a siderite-magnetite rock, with ~ 10% magnetite (<5mm), occurring with minor quartz and talc in possibly stockwork/vein and replacement bodies. The matrix exhibits a largely decussate texture, due to radiating aggregates (~5mm diameter) of a pre-existing silicate (amphibole or stilpnomelane?) now largely replaced by quartz and fine grained siderite (<20 microns). The matrix had no layering, veining, foliation or indication of original rocktype. There are coarse (<1mm) rounded porphyroblasts(?) of siderite. There is minor relict prismatic amphibole (grunerite?). The magnetite was mostly euhedral but is mostly fractured along crystallographic planes, and cemented by fibrous quartz, carbonate and talc.

This appears to a be a more altered version of C110622 and C108983. The origin is obscure but it may have been an altered igneous rock, skarn or metasomatic iron formation (amphibole and/or stilpnomelane rich), later brecciated and siderite-altered.

C110618; NBR7/55.3 Nelson Bay R Pr; mineralized skarn?

In hand specimen this rock is mottled off-white to brownish with fine pale green spotting and clots (to 5mm) and contains some disseminated magnetite (to 5mm) and diffuse patches of a black phyllosilicate, with no obvious veining or foliation.

This sample is a stilpnomelane - magnetite – siderite - quartz rock, with minor chlorite. The stilpnomelane flakes are brown and are up to 2 mm long, in sprays and flakes. Carbonate (siderite?) occurs mostly as fine grained material comprising most of the matrix (<0.05mm diameter) and as possible porphyroblasts (~1mm). Quartz occurs as fine spots and veinlets to about 50 microns across There appears to be some disseminated green-brown smectite-serpentine-chlorite pseudomorphs after coarse rounded phenocrysts of olivine (<10 mm) in the fine sideritic groundmass. There is abundant zircon and lesser monazite as dispersed, small prismatic grains (~0.1mm long). Magnetite (~1%) and ilmenite (~1%) occur as thin veinlets to ~1mm thick; these are highly brecciated and poikiloblastic, and partly altered to stilpnomelane(?). There is accessory pyrite (~3%) as euhedral to anhedral disseminated grains and some microveins to about 100 microns. The quartz and sulphide veins are overprinted by fine grained siderite.

The rock is unfoliated and may have been a highly altered mafic rock but the origin is obscure. The combination of zircon with olivine phenocrysts suggest it may have been a lamprophyric rock.

C110619; NBR7/68.3; Nelson Bay R Pr; amphibolite?

In hand specimen this rock is dark green with diffuse veins and zones containing decussate sprays of a black phyllosilicate (<5mm) in a massive, unfoliated groundmass.

This sample is a stilpnomelane-chlorite rock, with minor quartz and siderite and traces of fine radioactive monazite(?, trace, ~0.1mm). The brown stilpnomelane flakes (~20%) form radiating and platy aggregates up to 5mm across in a fine grained unfoliated chloritic matrix (~0.1mm grainsize). Siderite occurs as traces of scattered small spots to ~0.5mm. There is about 5% of quartz in small highly included granular patches to ~0.5mm. Biotite occurs as traces of relict, fine brown flakes in the chlorite, to ~0.2mm. Leucoxene is abundant as finely dispersed material (<0.1mm).

There is no foliation or indication of original rocktype, but the texture and leucoxene suggests it may have been a very chloritised mafic volcanic rock.

C110620; NBR8/94.7; Nelson Bay R Pr; mafic?

In hand specimen this rock is massive, pale grey-brown, fine grained rock with abundant fine clasts or crystals to about 6mm; it has a weak foliation.

This sample is a massive chlorite-siderite rock, with subordinate quartz, biotite, feldspar and minor apatite, ilmenite and pyrite. The chlorite is up to about 0.5mm and the siderite very fine grained (about 50 microns) in the matrix. There are clots of chlorite and talc, possibly pseudomorphing a pyroxene, plus biotite and possibly altered plagioclase phenocrysts, all to about 5mm. There are some disseminated poikiloblastic pyrite grains to about 1mm and apatite to about 0.5mm. Leucoxene and ilmenite are abundant as finely dispersed material (<0.1mm).

There is no veining or strong foliation but the phenocrysts of biotite, pyroxene? and plagioclase in a chlorite-ilmenite rich matrix suggest it was originally a mafic to andesitic volcanic to volcaniclastic rock.

C110621; NBR8/95.5; Nelson Bay R Pr; mineralized skarn?

In hand specimen this rock is mottled mid-brown and white with black magnetite spotting (<2mm) with a brown (siderite and/or limonite?) network and no foliation.

This sample is a weathered quartz-siderite-magnetite rock, with ~ 20% euhedral magnetite (<1mm), ~20% quartz (<0.1mm), ~5% fibrous amphibole (grunerite?, ~1mm), trace stilpnomelane? (<0.1mm), ~5% talc (<0.1mm) and ~35% siderite (porphyroblasts <2mm, and groundmass <0.05mm). The grunerite is partly altered to fine talc-quartz-siderite aggregates and the siderite largely to limonite. The magnetite has haloes of quartz, carbonate, talc (of uncertain origin but probably replacing an iron silicate?). There are numerous fine veinlets of quartz and siderite, to about 0.2mm wide.

The quartz and magnetite mostly occur in rounded aggregates in an altered amphibolitic matrix, which suggests a highly altered igneous or high grade metamorphic rock. There is no

foliation or veining but it may be an unusual altered ultramafic or a ferromagnesian skarn, formed by metamorphism of siderite-rich rocks.

C110622; NBR8/105.1; Nelson Bay R Pr; mineralized skarn?

In hand specimen this rock is massive, unfoliated, mottled pale greenish brown-white with fine to coarse black magnetite spotting and veining and no foliation.

This sample is a magnetite amphibolite, with ~ 20% magnetite (<10mm), ~55% fibrous amphibole (grunerite?, <2mm long), ~10% siderite, plus traces of fine (<0.5mm) disseminated flakes of biotite, stilpnomelane, chlorite and talc, and traces of zircon. The magnetite crystals are euhedral to subhedral in cross-cutting veins and disseminated grains, and are brecciated and cemented by fibrous veinlets of quartz, carbonate and talc. There are inclusions of chlorite, amphiboles pyrite to 0.5mm in the magnetite.

There is only some locally mylonitic foliation and veining but extensive alteration and little indication of original rocktype. It may be an altered mafic or an unusual ferromagnesian skarn, formed by metamorphism of siderite-rich rocks.

C108983 NBR002/236.5 Nelson Bay R, NBR002/236.5 skarn

In hand specimen this rock is massive, unfoliated, mottled pale greenish brown and white with black magnetite spotting and no foliation.

This sample is an altered magnetite amphibolite, composed of prismatic grunerite (~60%, <5mm), siderite (~20%, < 2 mm), magnetite (~10%, <3mm), minor fine grained stilpnomelane and chlorite (<0.1mm) and ~10% quartz (<0.2mm). The magnetite is mostly highly amoeboid with grunerite inclusions and is up about 3mm diameter, but some (earlier) is euhedral.

There is no foliation, veining or indication of original rocktype. It may be an altered mafic or an unusual ferromagnesian skarn, formed by metamorphism of siderite-rich rocks.

C108984 NBR002/236.9 Nelson Bay R, NBR002/236.9 skarn

This rock is a fine grained dark grey to black unfoliated rock with abundant fine pink garnet spotting (almandine: unpublished data, R. Bottrill).

The rock is composed mostly of biotite and garnet, with minor chlorite and quartz. The garnet is euhedral and is pale pink, up to 2mm diameter, with inclusion-filled cores, and fractured with some minor alteration to chlorite. There are some coarse grained biotite clots surrounded by biotite, which appears to be replacing amphibole phenocrysts (<5mm long). The matrix is composed of unfoliated, fine grained (~50micron) biotite, slightly altered to chlorite.

There is no foliation, veining or indication of original rocktype. It may be an altered mafic, a biotite garnet hornfels or an unusual ferromagnesian skarn, formed by high grade metamorphism of aluminous siderite-rich rocks.

Discussion & Conclusions

The rocks collected from these drillholes are all iron rich and could all be classified as iron formations (mixed carbonate-oxide-silicate), but include some probable original igneous rocks, all highly altered and of uncertain origin. The amphibole is probably grunerite and the carbonate probably siderite, but other similar minerals may be present (Bottrill, 2004). Some discussion of genetic implications of each rock and the Nelson Bay River magnetite deposit follows.

The mineralogy of the samples and estimated mineralogical iron distributions are summarised in Table 2. FeO* is the estimated Fe content, expressed as FeO, of the particular minerals, partly using data from Bottrill (2004).

Table 2: Summary of mineralogy and Fe distribution (approx. wt.%).

Mineral	**FeO***	C110617	C110618	C110619	C110620	C110621	C110622	C108983	C108984
Garnet	23								20
Biotite	30			1	10				65
grunerite	32	5				5	55	60	
magnetite	100	10	2		1	20	20	10	
siderite	45	70	50	1	30	35	10	20	
chlorite	30		5	65	25	1	3		10
stilpnomelane	32		25	25			5	1	
qtz	0	10	10	5	5	20	5	10	5
talc	5	5			10	5	1		
Kfeldspar	0				10				
Apatite	0				2				
Smectite	30		5						
Leucoxene	5			2	5				
Limonite	100					15			
pyrite	100		3		2		1		
tot mins		100	100	99	100	101	100	101	100
tot FeO	**wt%**	43.4	38.5	28.4	27.8	52.9	45.7	38.5	27.1
%Fe as Mt		23%	5%	0%	4%	38%	44%	26%	0%

C110617 is a metasomatic iron formation, brecciated and siderite-altered. There is no definitive evidence for an igneous origin, except for its resemblance to other samples in the suite; it may have originally been a carbonate rock, perhaps originally Fe-rich, altered to an amphibole skarn by a prograde reaction with siliceous hydrothermal fluids, eg:

$7FeCO_3 + 8SiO_2 + H_2O \rightarrow Fe_7Si_8O_{22}(OH)_2 + CO_2$

Siderite + quartz --> Grunerite

More oxidized fluids may have concurrently converted some of the siderite to magnetite:

$6FeCO_3 + O_2 \rightarrow 2Fe_3O_4 + 6CO_2$

Siderite --> Magnetite

The rocks have been later retrogressed to siderite-quartz assemblages by low temperature, carbonate-rich fluids. The retrograde reaction was probably the reverse of the prograde reaction, i.e.:

$Fe_7Si_8O_{22}(OH)_2 + CO_2 \rightarrow 7FeCO_3 + 8SiO_2 + H_2O$
Grunerite --> Siderite + quartz

.

C110618 is a stilpnomelane - magnetite – siderite - quartz rock and may have been a highly altered igneous rock, probably a carbonate-altered lamprophyric rock, based on the abundant zircon plus olivine phenocrysts. Some altered lamprophyre dykes have been recorded in the Temma – Balfour district during MRT mapping (Reed et al., 2007). The prograde alteration fluid would have been very iron rich and moderately oxidised. Stilpnomelane is characteristic of some iron formations found at relatively high pressure (up to glaucophane facies).

C110619 is a stilpnomelane-biotite rock which may have been a highly altered porphyroblastic mafic igneous rock, based on the fine Ti-oxides but there are few indications of the original rocktype. It may have been a mafic rock, K-metasomatised at relatively high pressure.

C110620 is mostly a siderite chlorite rock but phenocrysts of biotite, altered pyroxene? and plagioclase in a chlorite-ilmenite rich matrix suggest it was originally a mafic to andesitic volcanic to volcaniclastic rock or dolerite. . Some similar dolerite dykes have been recorded in the district during MRT mapping. The alteration is largely low grade greenschist facies with an overprint by Fe and carbonate rich fluids.

C110621 is a quartz-siderite-magnetite rock with little indication of original rocktype, but it resembles an altered version of C110622. It may be an unusual altered igneous rock or a ferromagnesian skarn, formed by metamorphism of magnesian siderite-rich rocks. The alteration may be largely due to oxidation of grunerite, forming magnetite and quartz, by oxidized carbonate rich fluids, e.g.:

$Fe_7Si_8O_{22}(OH)_2 + CO_2 + O_2 \rightarrow 2Fe_3O_4 + 8SiO_2 + FeCO_3 + H_2O$
Grunerite --> Magnetite + quartz + siderite

Alternatively, the rounded quartz-magnetite aggregates may form by oxidation of an iron silicate like fayalite, eg.:

$3Fe_2SiO_4 + O_2 \rightarrow 2Fe_3O_4 + 3SiO_2$
Grunerite --> Magnetite + quartz

C110622 is a grunerite amphibolite which may have been a highly altered alkaline igneous rock, from its zircon content and relative lack of Si, Ti and Al. Alternatively it may be an unusual ferromagnesian skarn, formed by metamorphism of magnesian siderite-rich rocks. The magnetite is highly deformed and cemented by late quartz-carbonate-stilpnomelane alteration. The stilpnomelane indicates the rock has undergone a high pressure metamorphism.

C108983 This rock appears very similar to C110622.

C108984 This is an unusual garnet-biotite rock and appears to be metasomatic, formed at moderate temperature and pressure. It may form in a similar way to the garnet-rich zones which form selvages about the Ca-Mn-Fe carbonate and pyroxenoid rich metamorphosed ore deposits of Broken Hill, NSW. It is probably formed due to metamorphic devolatisation of Fe-carbonate bodies, forming high temperature Fe-metasomatism of some siliceous and aluminous wallrocks. The amphibole pseudomorphs may indicate either porphroblasts in a mafic rock or porphyroblasts in a metasedimentary rock.

Collectively, the origin of these rocks is obscure – some rocks appear to have originally been igneous rocks (possibly dolerite and lamprophyres), while others were probably originally carbonate bodies, and yet others possibly sedimentary pelites and high pressure-formed stilpnomelane-rich iron formations. These rocks were metasomatised by moderately oxidised Fe and carbonate rich fluids, perhaps derived in part from the thermal decomposition of siderite bodies by a high temperature thermal pulse, possibly related to the local Devonian granite?). The mineralogy of these iron-rich rocks is similar in part to that described for other iron and base metal deposits in the Temma district by Bottrill (2004) and Bottrill and Taheri (2004).

The only significant mineralisation identified was iron (as siderite and magnetite), and possibly rare earths (as monazite).

There are some interesting similarities and differences with the Savage River magnetite deposits. This group of deposits essentially comprises a fault-controlled zone with intermixed magnesite and dolomite-rich carbonate bodies and mafic rocks, which have all undergone pre- to syn-deformational high temperature alteration and strong retrogression mélange (Bottrill and Taheri, in prep.). The main difference is that the Nelson Bay River deposit is comparatively Ca and Mg-poor and lacks a strong foliation. It requires some more detailed logging, petrology and especially some whole rock (especially immobile element) geochemistry to unravel its origin.

REFERENCES

Bottrill R.S., 2004, Miscellaneous mineral analyses from near Balfour and Temma. Unpub. Mineral Resources Tasmania, Report UR2004/06

Bottrill, R. S.; Taheri, J., 2004. The nature and origins of copper and tin-tungsten deposits in the Balfour - Temma area, northwest Tasmania. Mineral Resources Tasmania, Report UR2004_05

Bottrill, R. S.; Taheri, J., 2006. The Savage River iron deposits and other mineral deposits of the Arthur Metamorphic Complex – A brief summary. Mineral Resources Tasmania, Report UR2006_05

Bottrill, R. S.; Taheri, J., 2008. Petrology of the host rocks, including mineralisation and adjacent rock sequences, from the Savage River mine. Mineral Resources Tasmania, Report *UR* 2007/05

Reed, A.R., Seymour, D.B, Calver, C.R., Everard, J.L., Green, D.C., McClenaghan, M.P., 2007, Regional geology of the Southern Smithton Synclinorium. Explanatory Report for the Roger, Sumac and Dempster 1:25 000 scale geological map sheets, far northwestern Tasmania. Mineral Resources Tasmania, Report UR ER25_2 -

R. Bottrill
MINERALOGIST/PETROLOGIST

Disclaimers

While every care has been taken in the preparation of this report, no warranty is given as to the correctness of the information and no liability is accepted for any statement or opinion or for any error or omission. No reader should act or fail to act on the basis of any material contained herein. Readers should consult professional advisers. As a result the Crown in Right of the State of Tasmania and its employees, contractors and agents expressly disclaim all and any liability (including all liability from or attributable to any negligent or wrongful act or omission) to any persons whatsoever in respect of anything done or omitted to be done by any such person in reliance whether in whole or in part upon any of the material in this report.

These analyses collected in the MRT laboratories, along with some other data on the samples submitted, may enter the MRT databases but every attempt will be made to ensure the data remains closed file and not be available externally, except at your request.

Plate 1: Photomicrographs

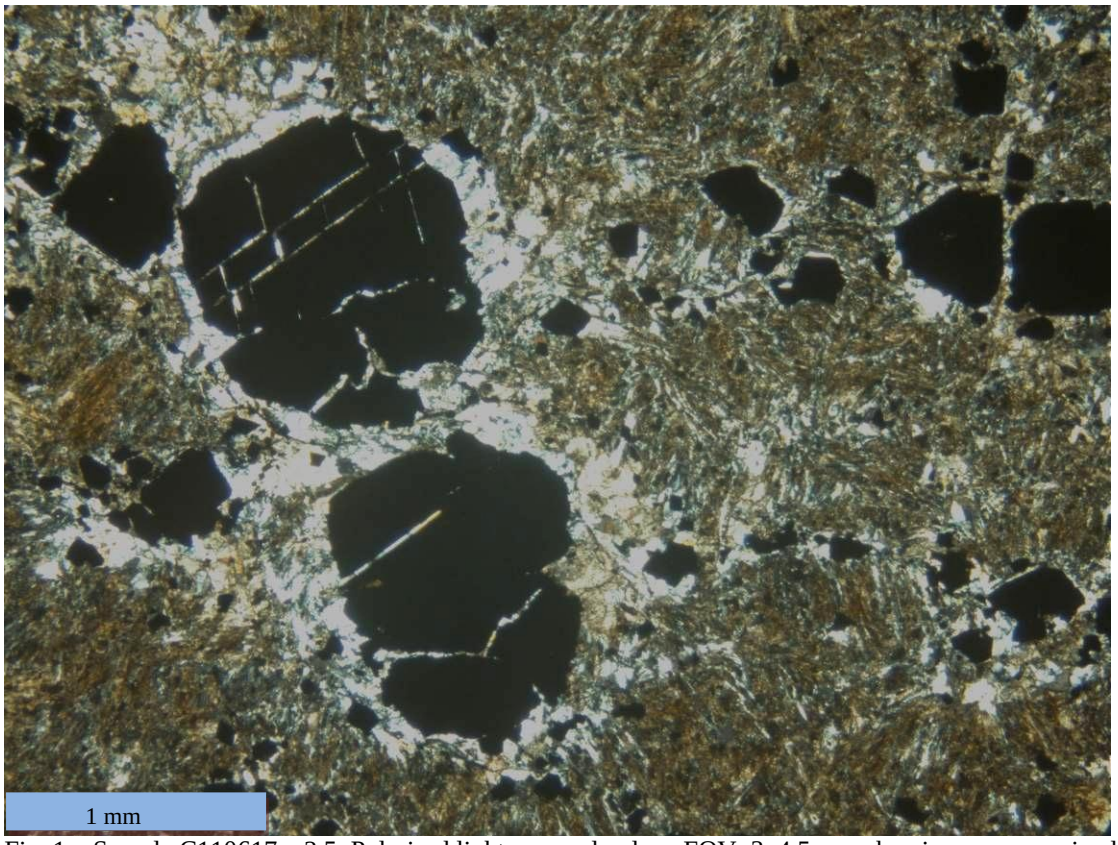

Fig. 1. Sample C110617, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing coarse grained magnetite (black) with quartz-rich haloes in a fine grained siderite-quartz matrix (probably replacing amphiboles)

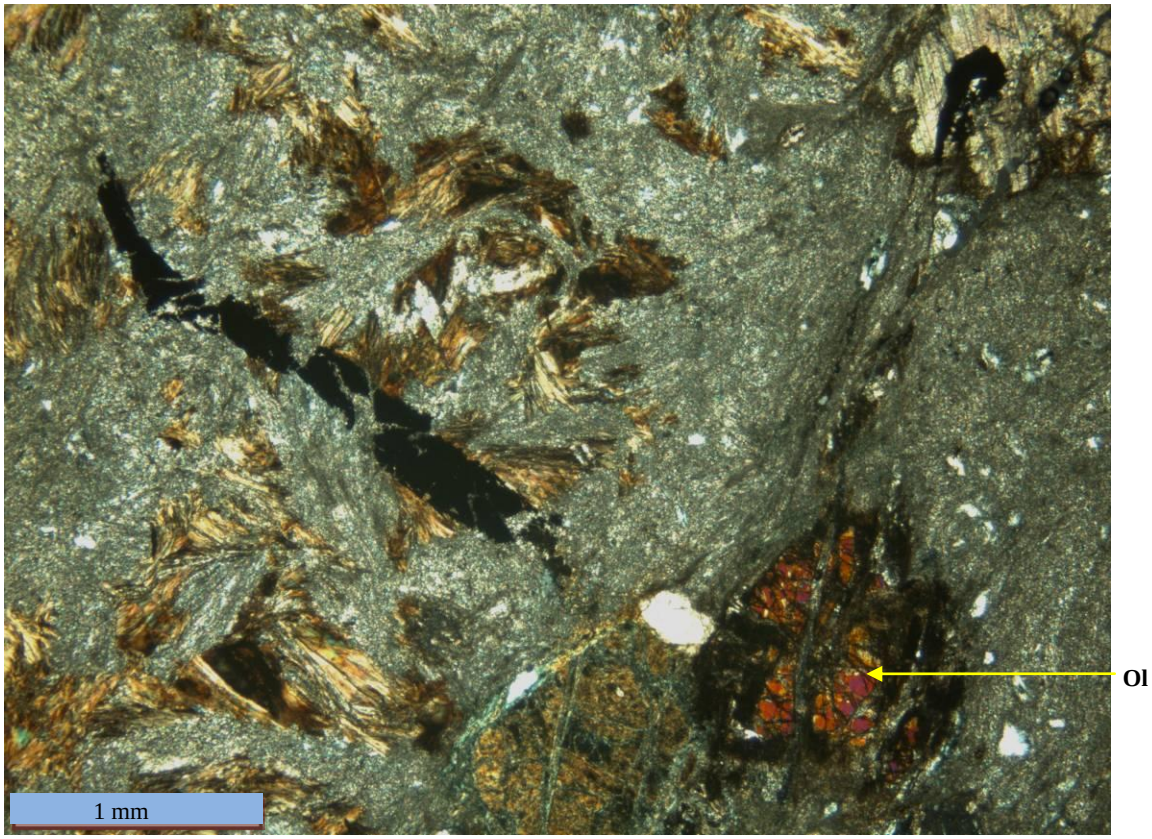

Fig. 2. Sample C110618, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing coarse grained, altered olivine (Ol), black magnetite vein and brown stilpnomelane in a fine grained siderite matrix with white quartz spots.

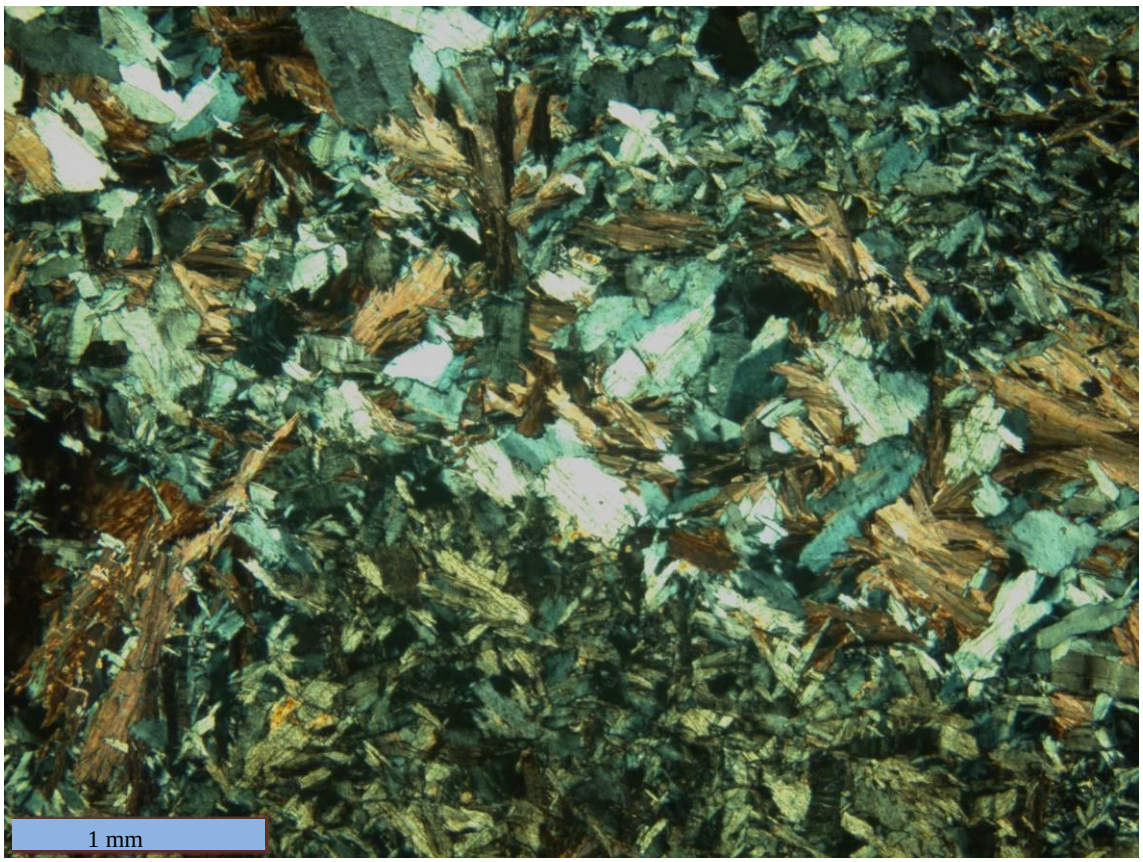

Fig. 3. Sample C110619, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing coarse grained brown stilpnomelane in a medium and coarse grained green chlorite matrix.

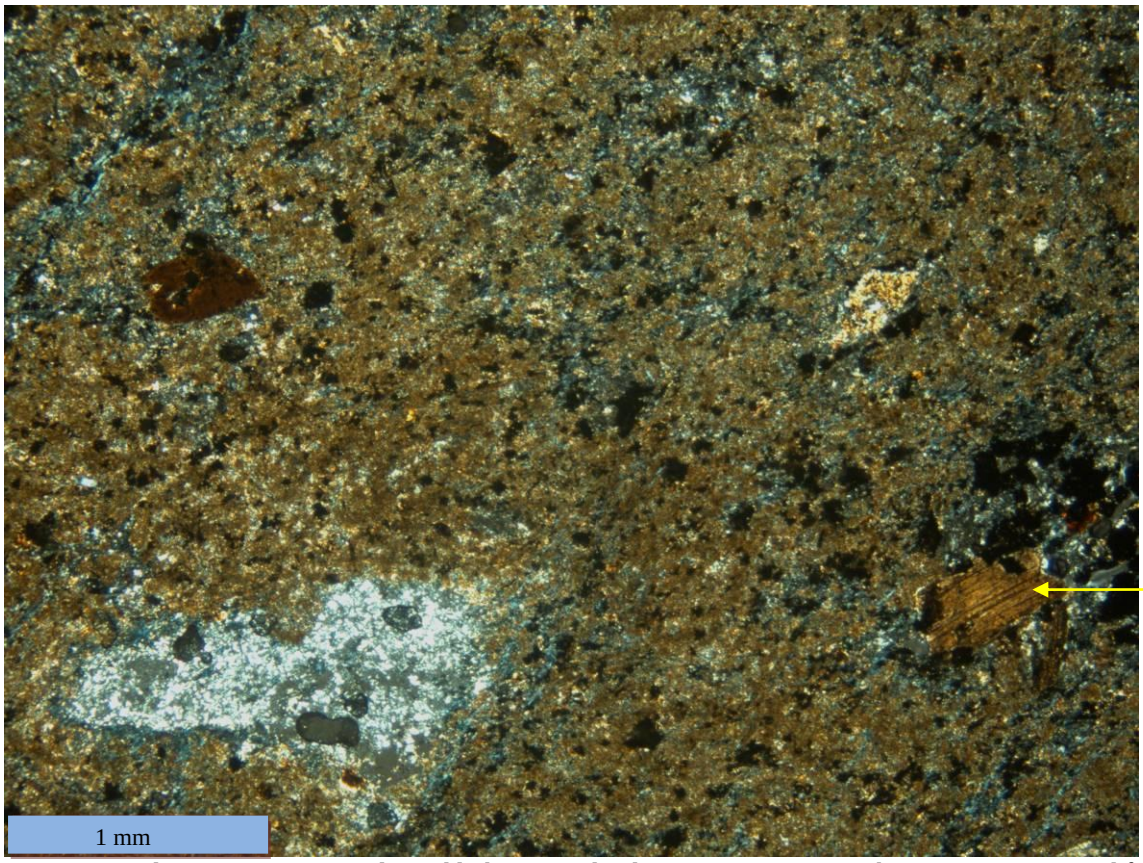

Fig. 4. Sample C110620, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing coarse grained feldspar (white) and biotite (Bt) , in a fine grained chlorite-siderite matrix.

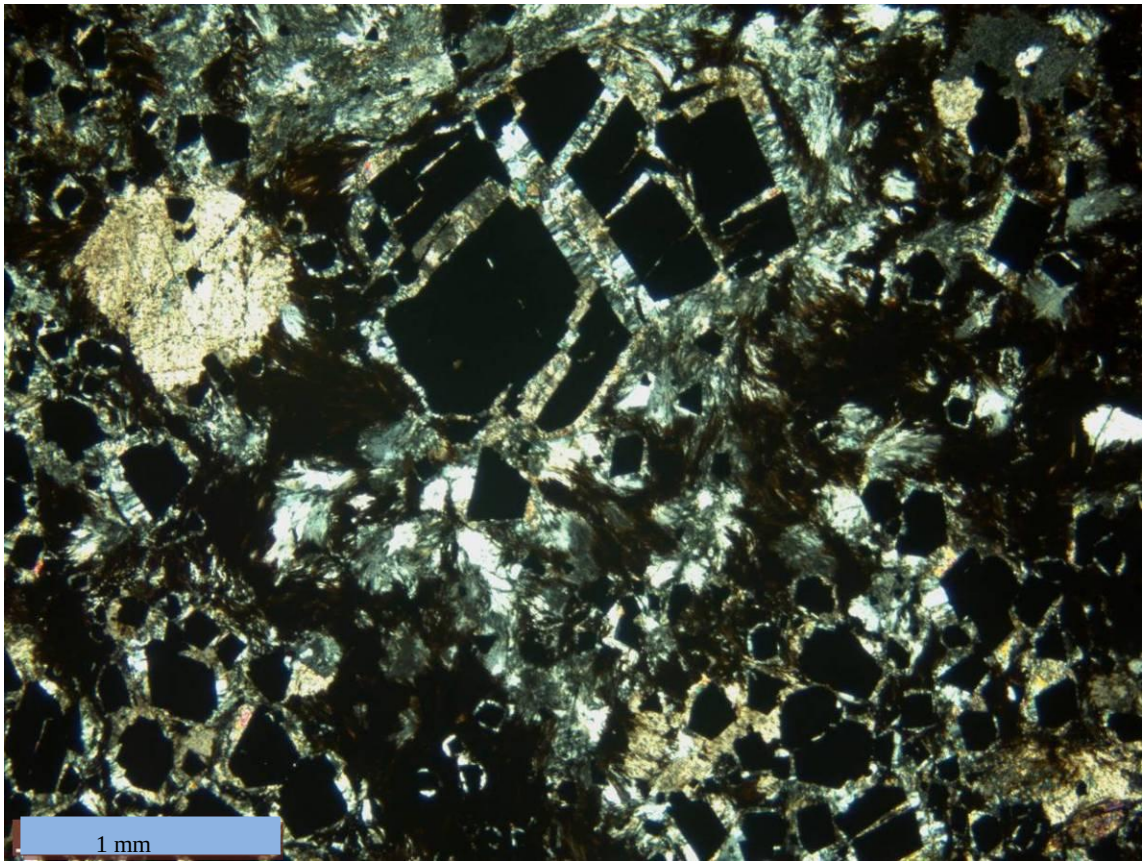

Fig. 5. Sample C110621, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing medium and coarse grained brecciated magnetite (black) surrounded and veined by quartz and siderite, plus coarse siderite (cream), in a matrix of weathered, fibrous siderite-amphibole.

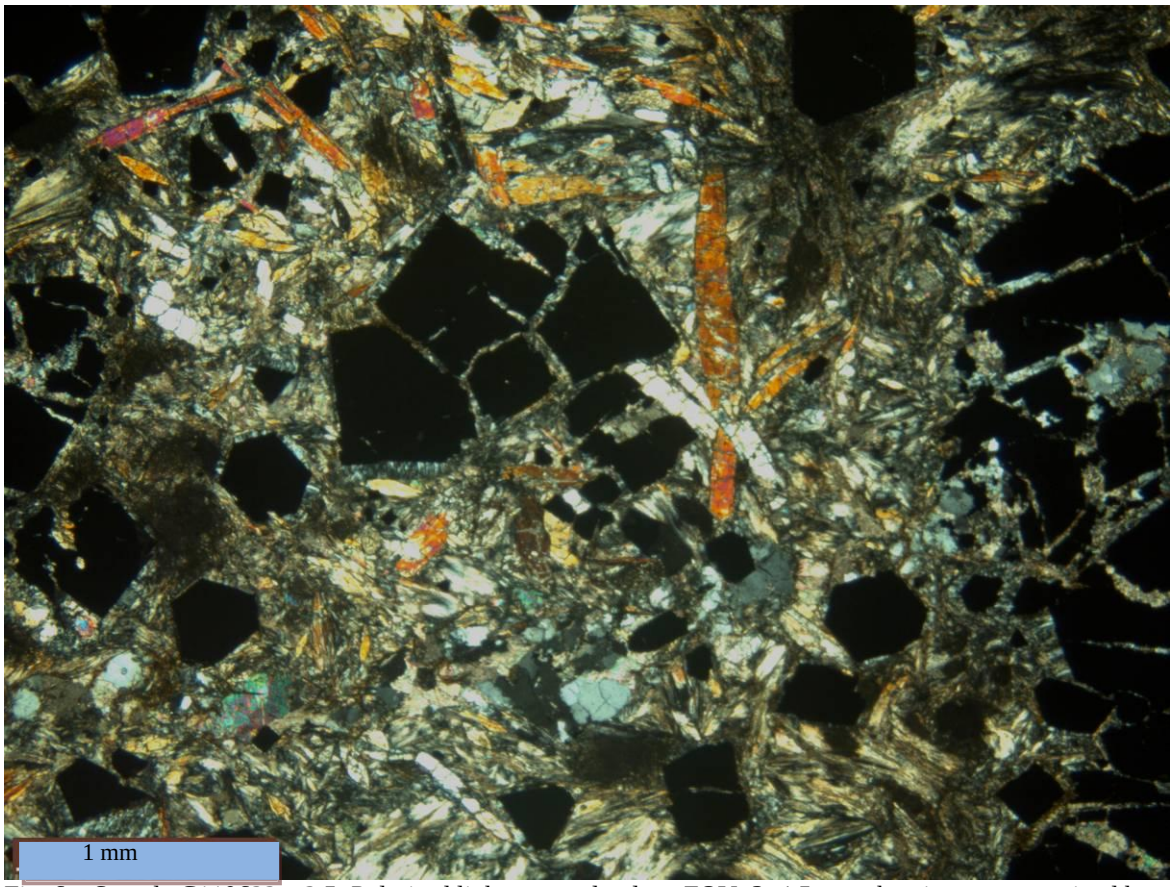

Fig. 6. Sample C110622, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing coarse grained brecciated magnetite (black) and prismatic to fibrous aggregates of grunerite with interstitial quartz and carbonate.

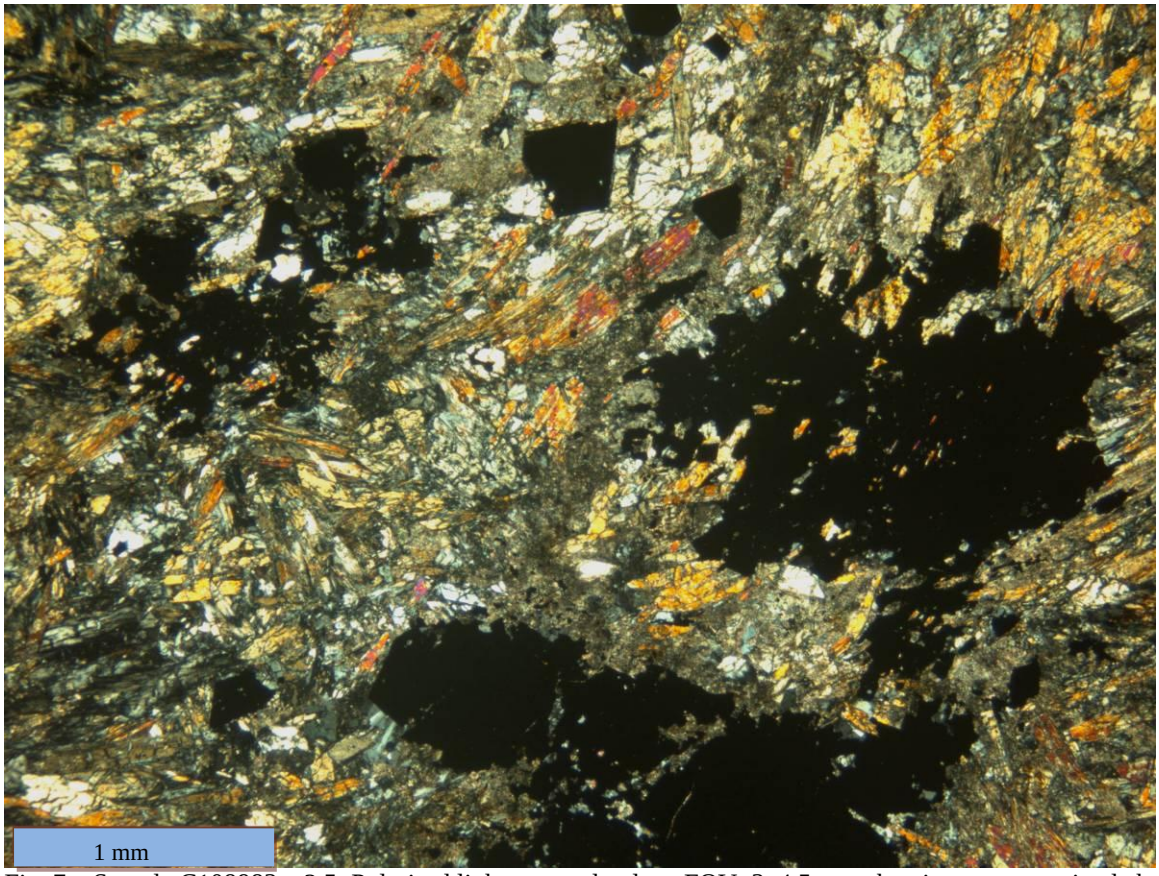

Fig. 7. Sample C108983, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing coarse grained skeletal and euhedral magnetite (black) and prismatic to fibrous aggregates of grunerite with interstitial quartz and carbonate.

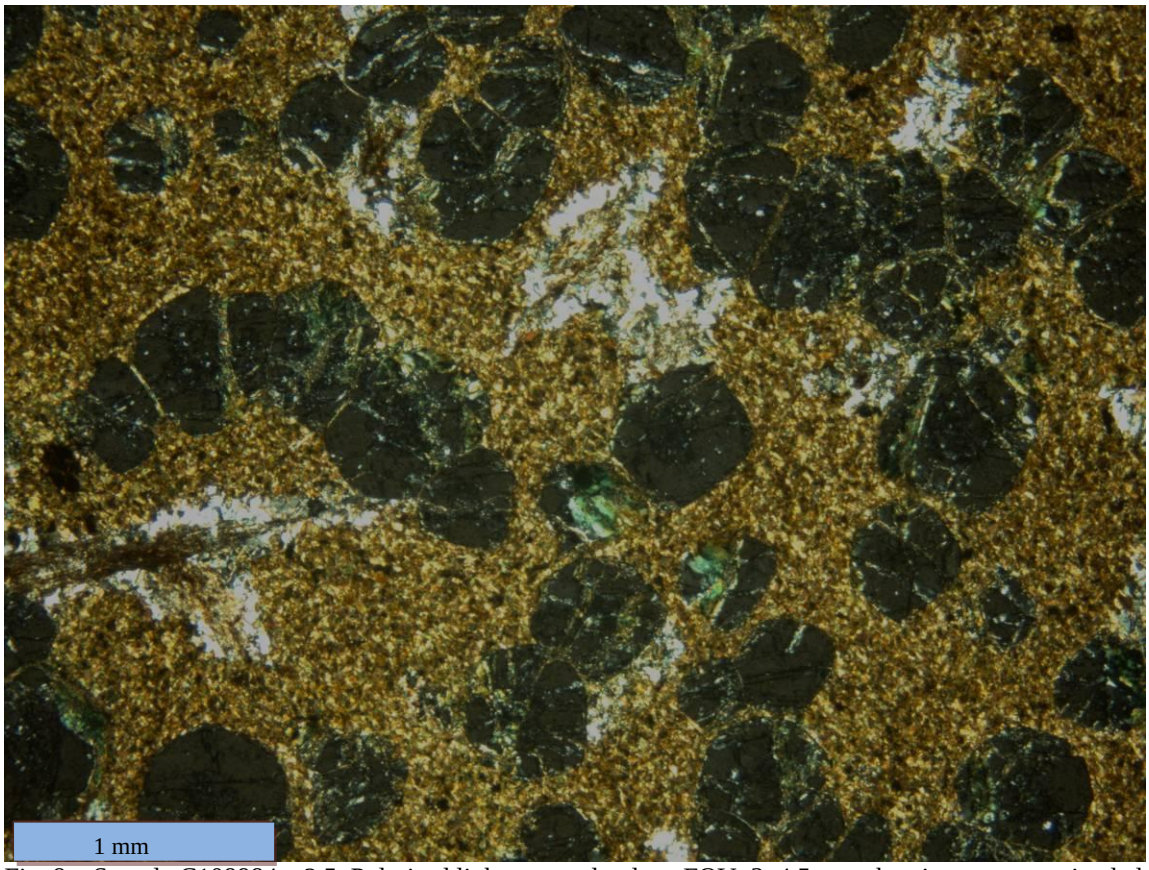

Fig. 8. Sample C108984, x2.5, Polarised light, crossed polars, FOV: 3x4.5mm, showing coarse grained almandine garnet (dark) with chlorite alteration, and quartz-biotite pseudomorphs, in a matrix of fine grained biotite.

Plate 2: Photomacrographs

Fig. 9. Sample C110617, showing coarse grained magnetite (black) as networks in brown sideritic matrix.

Fig. 10. Sample C110618, showing pale green spotting and clots, disseminated magnetite (to 5mm) and diffuse patches of a black phyllosilicate.

Fig. 11. Sample C110619, showing diffuse veins and zones containing decussate sprays of a black phyllosilicate in a massive, unfoliated chloritic groundmass..

Fig. 12. Sample C110620, showing a massive, pale grey-brown, fine grained rock with abundant fine clasts or crystals.

Fig. 13. Sample C110621, showing a mottled grey-brown-white, medium grained rock with abundant fine magnetite.

.

Fig. 14. Sample C110622, showing medium and coarse grained magnetite veins and disseminations in a fine to grained grunerite matrix.

Fig. 15. Sample C108983, showing medium grained magnetite disseminations in a fine to grained grunerite-siderite matrix..

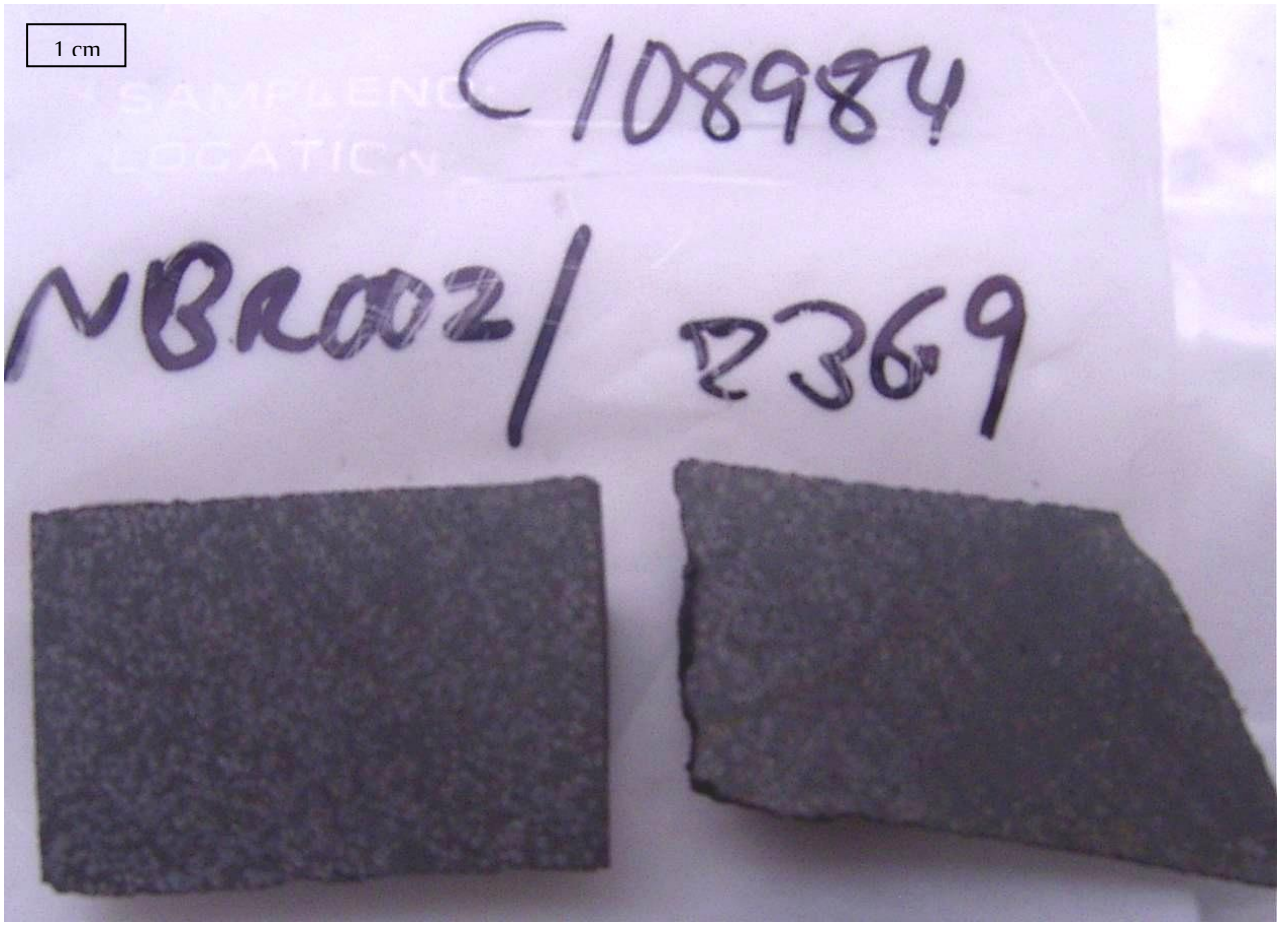

Fig. 16. Sample C108984, a black unfoliated rock with abundant fine pink garnet spotting.