Hercynian UHT metamorphism of crustal xenoliths from Bou Ibalghatene and Tafraoute, Middle Atlas, Morocco

MSc thesis
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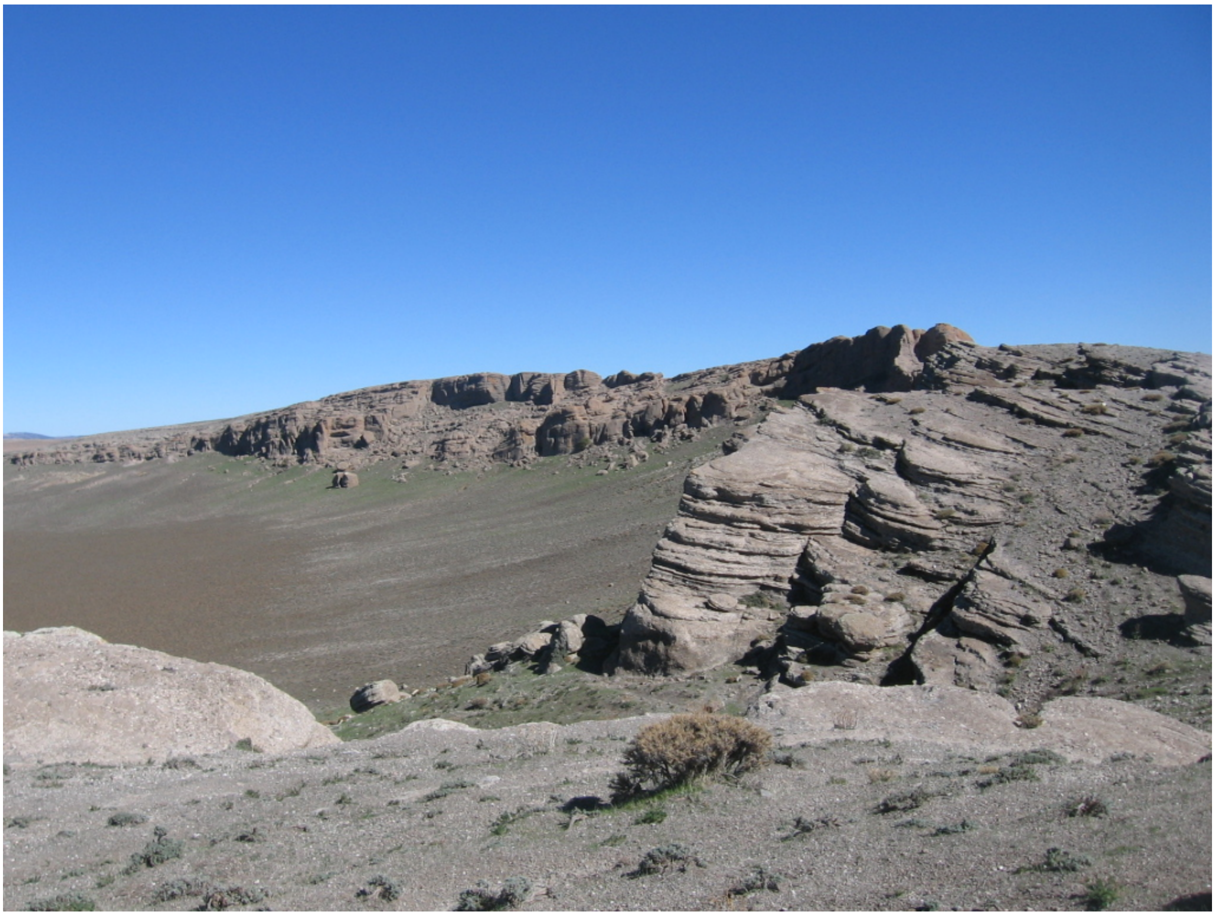

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Abstract

The Bou Ibalghatene and Tafraoute volcanoes in the Middle Atlas of Morocco erupted during the Pliocene to Quaternary as alkali basalts (Moukadiri and Bouloton 1998, Moukadiri and Pin 1998), enclosing numerous xenoliths. Both mantle and crustal xenoliths are found, but mantle xenoliths are more abundant.Crustal xenoliths from both volcanoes are the subject of this thesis. There are four types of crustal xenoliths, three of which occur in Bou Ibalghatene and two in Tafraoute:

- orthogranulite without garnet (Bou Ibalghatene and Tafraoute)
- orthogranulite with garnet (Bou Ibalghatene)
- orthogranulite with garnet and orthopyroxene (Bou Ibalghatene)
- paragranulite with garnet and sillimanite (Tafraoute)

The main focus lies on crustal xenoliths which contain garnet. The xenoliths were studied using optical microscopy, microprobe analyses, SEM analyses, element mapping, monazite dating and Raman spectroscopy. Using various thermobarometric techniques (garnet-orthopyroxene thermobarometry, two-feldspar thermometry, and TWQ and Perplex modelling) a PT-path for the xenoliths has been constrained. The PT-path is approximately the same for the xenoliths from the two volcanoes. It consists of 4 stages, of which the first three are representative for the lower crust below the Middle Atlas, whereas the last stage represents the magma upwelling and finally the eruption. The peak metamorphic conditions experienced by the xenoliths, at least 900-950 degrees at 10 kb, were of the Ultra-High-Temperature (UHT) type, and are dated at ~300 Ma, i.e. Hercynian, using monazite dating. This is a new location of UHT type metamorphism in the world. There could be no larger contrast with the low-grade metamorphism that dominates the surface geology. After the peak metamorphism there was a period of cooling, from 900-600 degrees. Based on complete homogenisation of the garnet grains and Fe-Mg diffusion, the cooling was a slow process of at least 8 Ma, but probably in the order of 200 Ma.

A garnet decompressional breakdown reaction was obsereved in all xenoliths containing garnet. Garnet breaks down to form a symplectite of orthopyroxene, plagioclase and spinel. The orthopyroxene found in the symplectite has extremely high values of Al content (up to 17.3 wt%). This garnet breakdown reaction took place at very high temperatures during the transport of the xenoliths to the surface, probably within a few days.

Introduction

Geology of Morocco

Morocco is located in the NW of Africa, in the west bounded by the Atlantic passive margin, and in the north an active plate collision zone, the alpine belt system. Southern Morocco is part of the West African Craton (WAC), which is between 2 and 3 Ga old. Morocco has two SW-NE trending mountain belts, the Anti-Atlas and the Atlas system, with elevations up to 4000 m in the High Atlas, and elevations up to 2700 m in the Anti-Atlas. The Northern part of Morocco has another mountain belt, the Rif Belt, formed during the Alpine orogeny. It is the counterpart of the Betic Cordilleras in the south of Spain, to which it is connected through the Gibraltar Arc. These three mountain belts resulted from a succesion of three orogenies, in chronological order: the Pan-African orogeny (760-560 Ma), the Variscan orogeny (350-270 Ma), and the Alpine orogeny (40 Ma-present) (Michard et al. 2008). Figure 1 shows the different geological regions in Morocco.

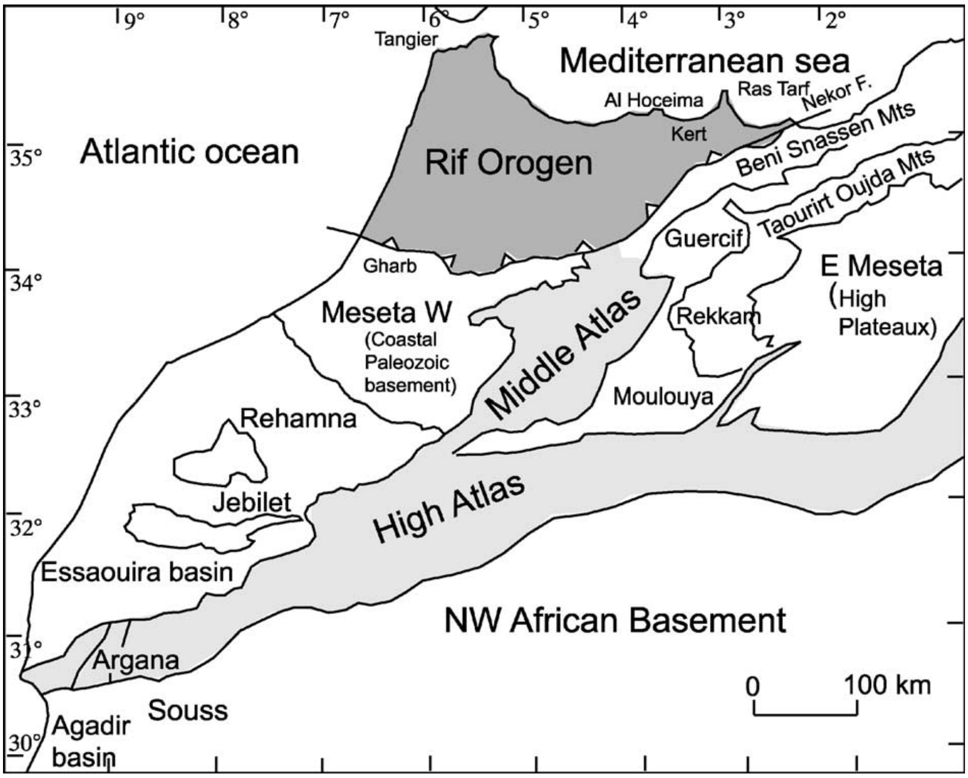


Figure 1 Tectonic sketch map of Morocco showing the different geological regions in Morocco (Ait Brahim et al. 2002).

Middle Atlas

The Variscan orogeny (350-270 Ma) is the main orogeny affecting Morocco. It is preceded by the Caledonian (460-420 Ma), together they developed the Caledonian –Variscan belt through a series of oceanic closures and collisional events. This belt is situated along the NW side of Africa, and resulted from the collision of Gondwana with Laurentia, Baltica and some other terranes. This major orogen is associated with several ophiolitic sutures and high to ultra-high pressure metamorphism. But only the southern external parts of the belt are preserved in northern Morocco (Meseta Block, including most of the Atlas Basement), which lacks ophiolites and high pressure metamorphism (Michard et al. 2008, chapter 1). The Atlas-Meseta domain is strongly deformed, more to the south, in the Anti-Atlas and in Algerian Ougarta, the deformation is less. The P-T conditions of the rock do not exceed low-grade greenschist-facies conditions during the main Variscan folding (Michard et al. 2008) Figure 2 shows a possible geodynamic evolution of Morocco from 560 to 320 Ma (Michard et al. 2008)

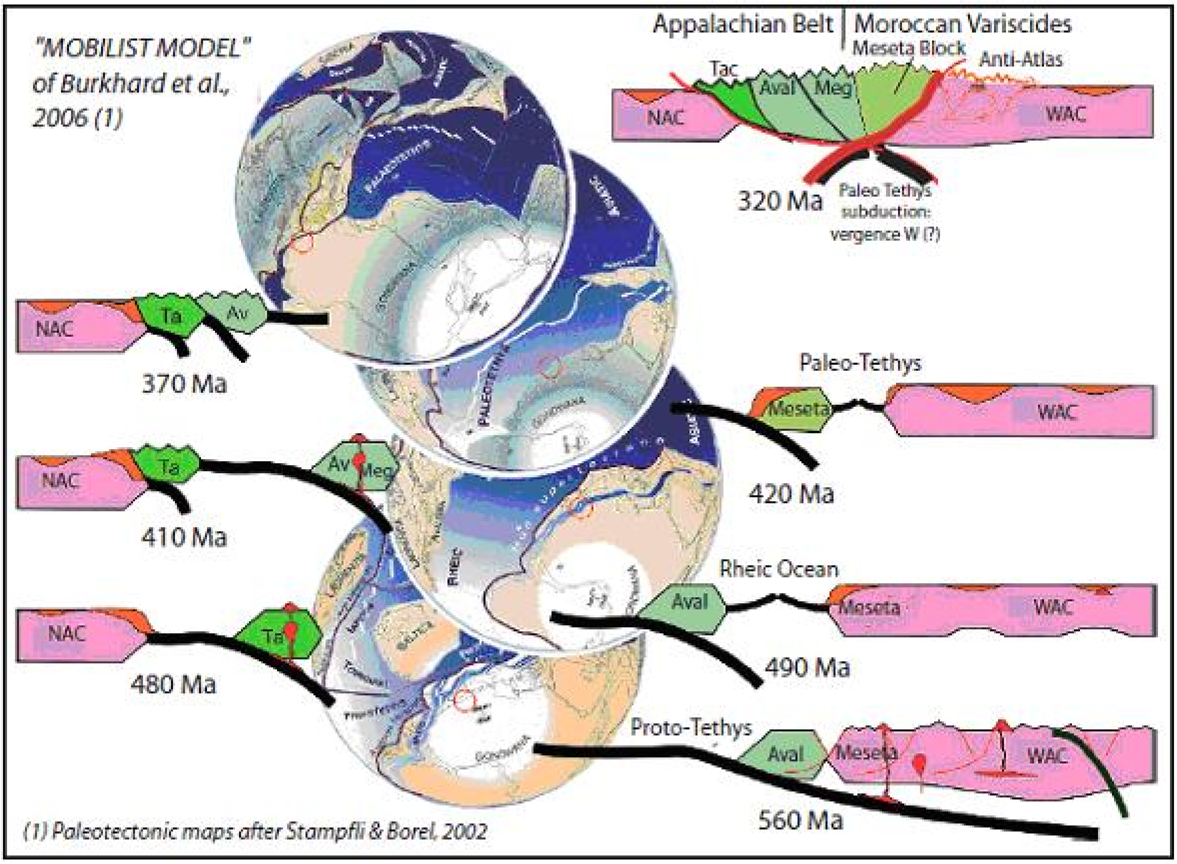


Figure 2 Geodynamic evolution of Morocco from 560-320 Ma. Michard et al. (2008)

During the Alpine orogeny three mountain belts were formed: the High Atlas, the Middle Atlas and the Rif belt part of the Maghrebides.

The Atlas system consists of two intracontinental belts, the High Atlas and Middle Atlas, formed by the inversion of aborted Triassic-Jurassic rifts, and is located on the northern boundary of the WAC. The opening of the Central Atlantic was accompanied by left lateral movement between Europe and Africa with a general extensional and transtensional regime in the boundary zones. The splitting of the Atlas Tethyan domain resulted in a complex network of numerous sub-basins, of which the normal faults of the half grabens have been partly reactivated Variscan faults. With the onset of convergence between Africa and Europe in the late Cretaceous, the shortening of the Atlas system began (Michard et al. 2008). The

orogenic relief building which contributes to the current topography began by the Middle Eocene. From the Middle Eocene until now the deformation occurred in two distinct episodes, separated by a period of subsidence and relative tectonic quiescence in the Oligo- to Miocene. In this period the Atlas system was completely buried under a mass of dominantly clastic deposits. Local extensional tectonics accompanied the subsidence of the Atlas system. The second episode of compressional tectonics started after the Neogene deposition of molasses and is still active (Frizon de Lamotte et al. 2009).
The lithosphere under the Atlas has a depth of only 60-70 km according to modelling done by Zeyen et al 2005, Teixell et al. 2005 and Missenard et al. 2006. This is shown in a cross section in Figure 5. Figure 6 shows the lithosphere-asthenosphere boundary of the whole of Morocco from elevation and geoid data (Fullea et al. 2007). This is somewhat thicker than in the other models but still shows a thinned lithosphere.
Figure 4 shows a transect through the Atlas, with approximately 12 % shortening along that line. The high topography of the Atlas cannot be explained by crustal thickening alone (Arboleya et al. 2004) as the crust of the Middle Atlas is considered too thin. From seismic data it is known that the total crustal thickness is 35 kilometer (Wigger et al 1992). The widespread presence of Cenozoic alkaline volcanics and low seismic velocities suggest the existence of a thermally anomalous mantle contributing to the extra uplift in the region (Arboleya et al. 2004). This large thermal factor contributes to an extra elevation of 1000 meters in the Atlas according to Missenard et al. 2006 and Frizon de Lamotte et al. 2009. This extra thermal factor is due to a thinned mantle lithosphere beneath Morocco. This strip of thinned mantle lithosphere runs from the Canary Islands through Morocco to southern Spain, and continues possibly all the way to France (Michard et al. 2008). and is known as the Moroccan hot line. It is also linked to the intraplate alkaline volcanism of Miocene to Quaternary age. Figure 9 shows the tectonic/magmatic and lithospheric events of the Atlas region from 80 Ma to present. One of the hypotheses postulates sublithospheric mantle flow beneath the northwest African plate, originating from the mantle plume under the Canary Islands (Duggen et al. 2009). However, this model is strongly debated (Berger et al. 2009) and an alternative model suggests that the volcanism and thermal uplift of the Middle Atlas resulted from reactivation of inherited geological structures and thermal erosion, remelting, of the metasomatized lithospere during Africa-Europe convergence (Raffone et al. 2009, Berger et al. 2009).
The crustal geotherm in Figure 7 shows that the current lower crust at the Middle Atlas has temperatures of around 800 degrees, being the highest temperature for the lower crust in the Moroccon domains from Rimi 1999 (Figure 8). As no volcanoes have been active in the last 0.5 Ma, the lower crustal temperatures may have been even higher in the Miocene and Pliocene.

As can be seen in Figure 3 and in the cross section in Figure 4, the Middle Atlas is made up of Mesozoic rocks and minor Paleozoic and Cenozoic occurences, resting upon a Paleozoic basement. In some places within the Atlas and more abundantly in the Moroccan Meseta and the Anti Atlas, Paleozoic basement rocks crop out which were affected by the Hercynian orogeny (Arboleya et al. 2004, Piqué et al. 2002). The degree of metamorphism of the rocks present at the surface affected by the Hercynian orogeny is low grade metamorphism (Michard et al. 2008).

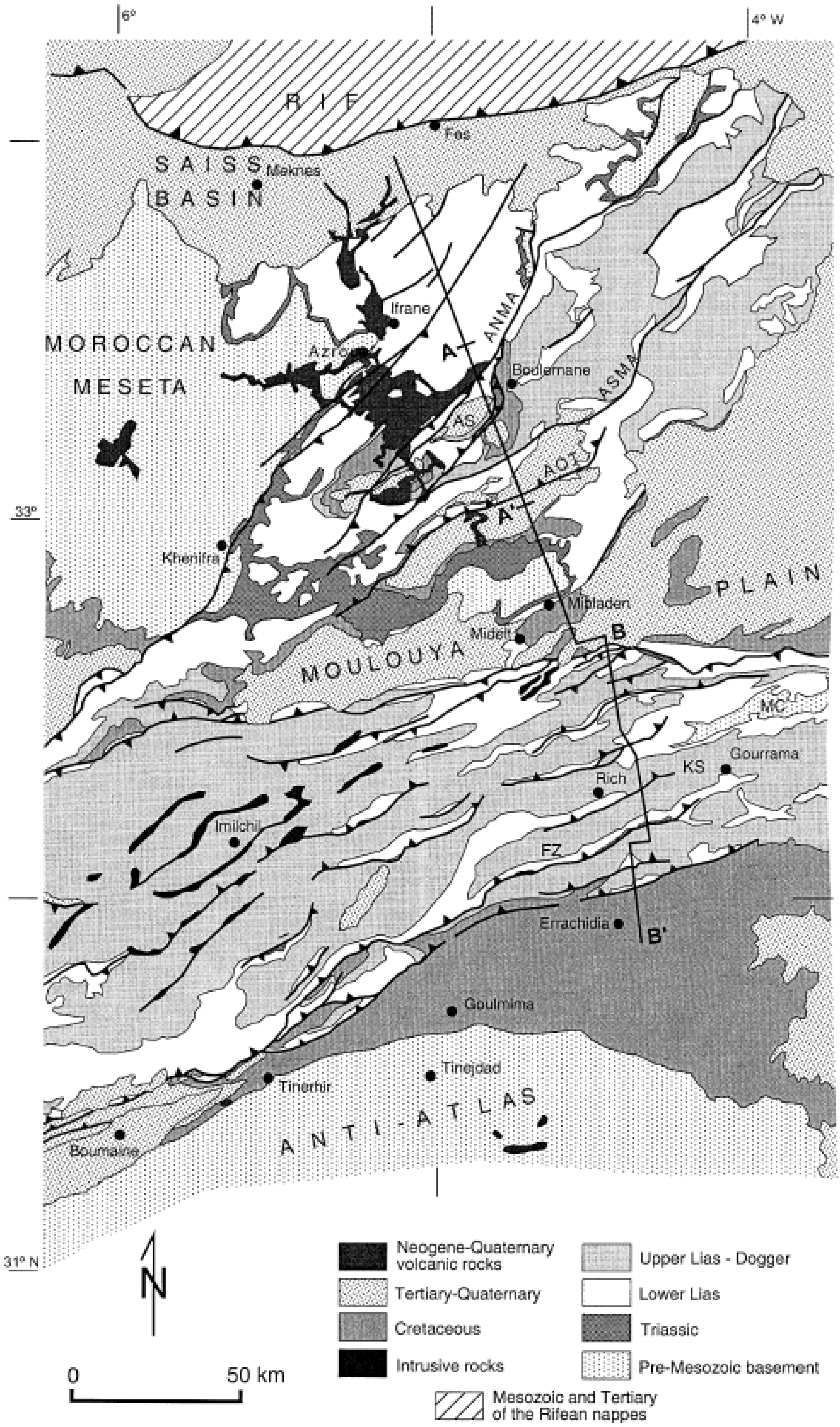


Figure 3 Geological map of the Middle Atlas and part of the High Atlas. Cross section line of Figure 4 is indicated by A-A'. Modified after Arboleya et al. 2004.

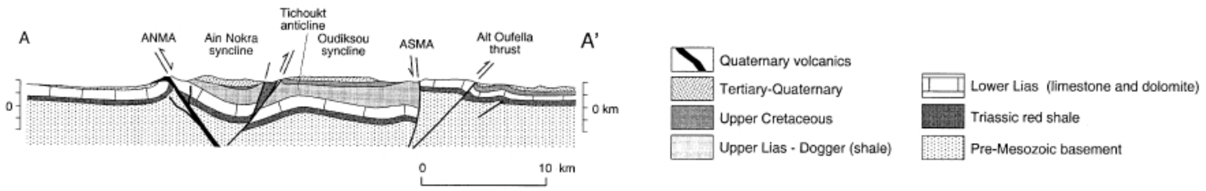


Figure 4 Cross section of the central, deformed belt of the Middle Atlas, as indicated in Figure 3 (Arboleya et al. 2004)

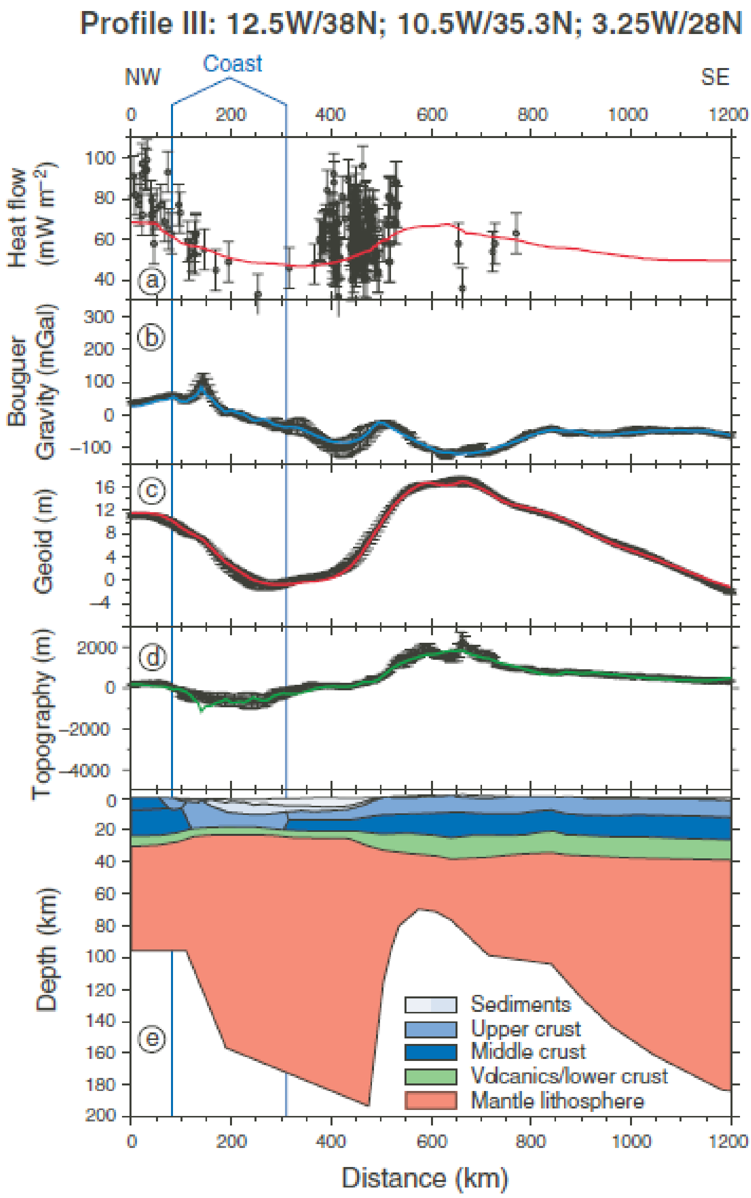


Figure 5 Lithospheric model through the Atlas showing a thinned lithosphere (Zeyen et al. 2005 and Teixell et al. 2005)

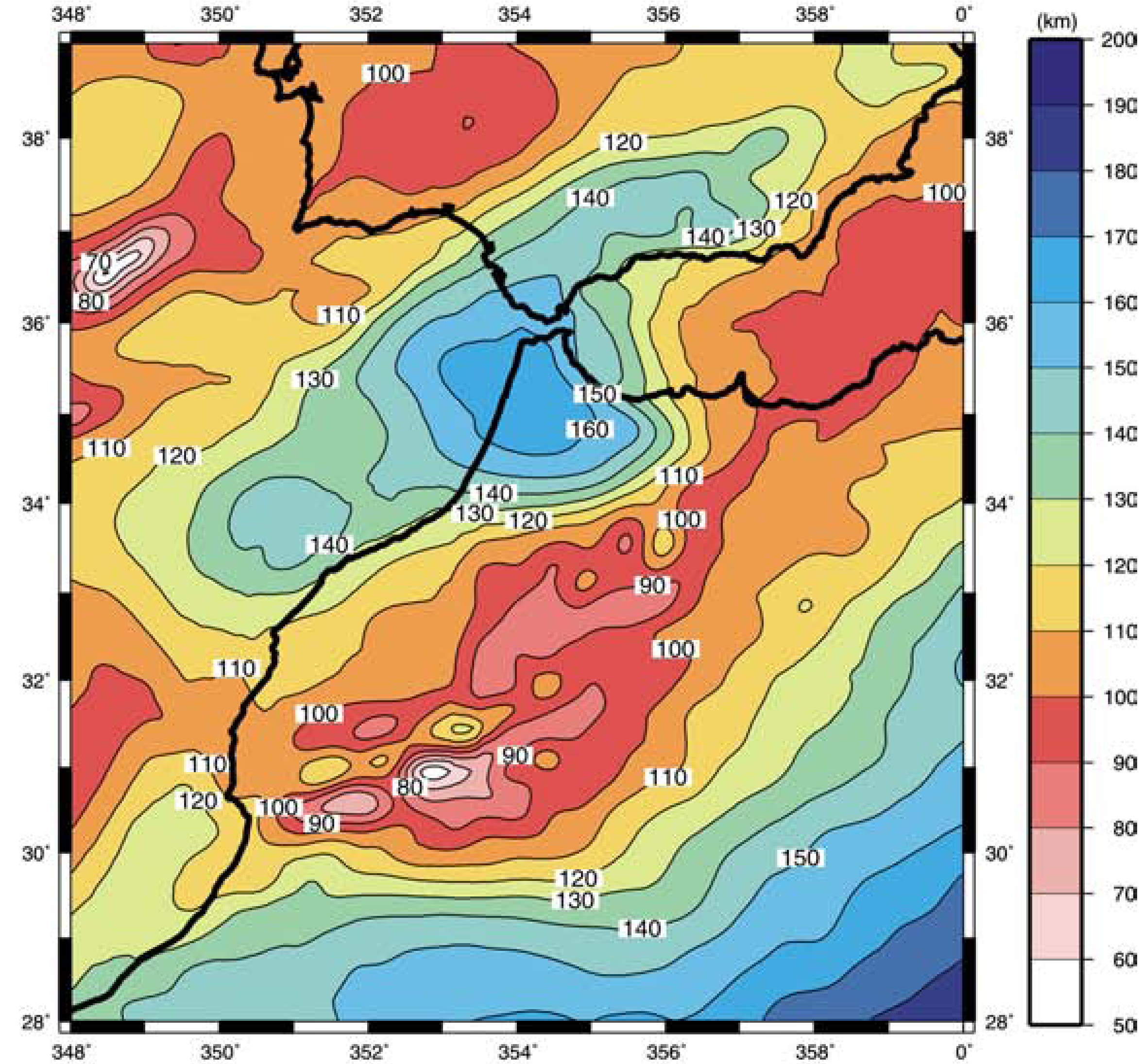


Figure 6 Lithosphere-asthenosphere boundary derived from elevation and geoid data (Fullea et al. 2007).

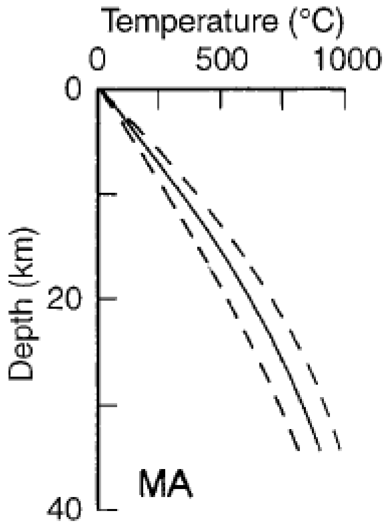


Figure 7 Crustal geotherm of the Middle Atlas (MA). The dashed lines represent the variation range of the temperature depth profile (Rimi 1999).

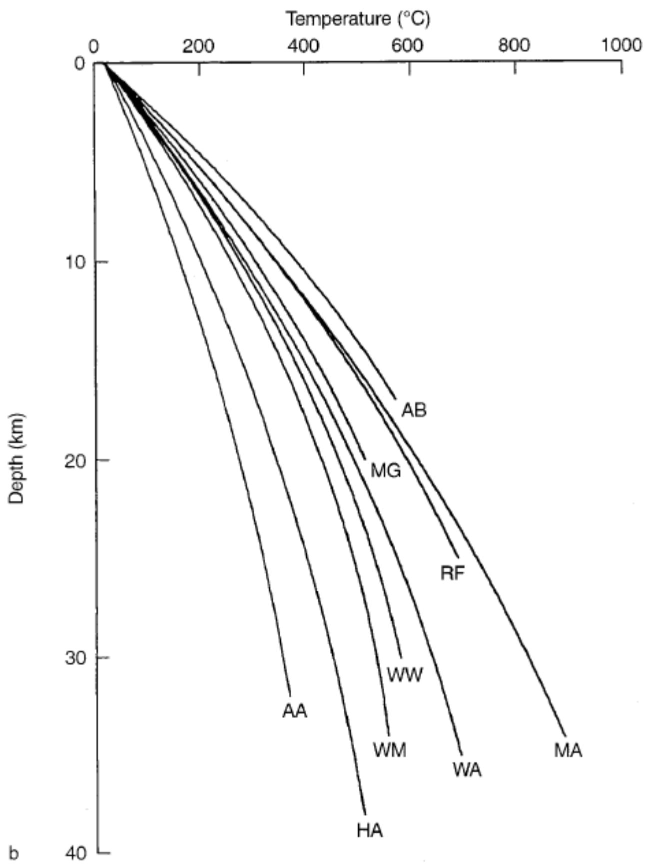


Figure 8 Average crustal geotherms of: Alboran basin (AB); Rif (RF); Middle Atlas (MA); South Atlantic margin (MG); High Atlas (HA); Western Meseta-Atlas (WA); Western Meseta-Western High Atlas (WW); Western Meseta (WM); Anti Atlas (AA) (Rimi 1999).

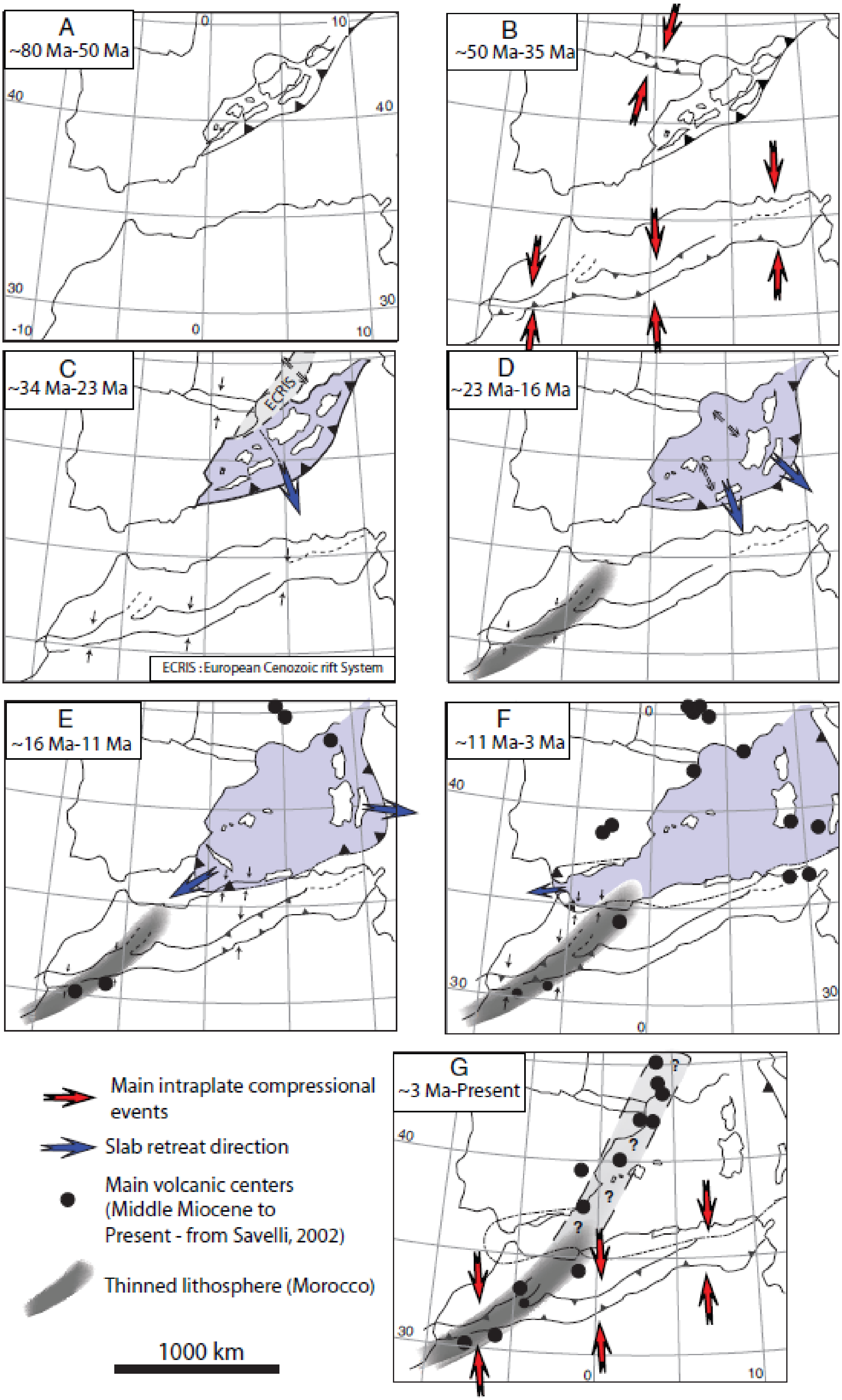

A
~80 Ma-50 Ma
B
~50 Ma-35 Ma
C
~34 Ma-23 Ma
ECRIS
ECRIS : European Cenozoic rift System
D
~23 Ma-16 Ma
E
~16 Ma-11 Ma
F
~11 Ma-3 Ma
G
~3 Ma-Present
Main intraplate compressional events
Slab retreat direction
Main volcanic centers (Middle Miocene to Present - from Savelli, 2002)
Thinned lithosphere (Morocco)
1000 km

Figure 9 Chronology of the Atlas tectonic/magmatic and lithospheric events. (Michard et al. 2008)

Azrou volcanic field

Scattered volcanic activity occured during the middle and late Miocene (15- 6 Ma) in the Middle Atlas (Raffone et al. 2009). During the Quaternary (1.8- 0.5 Ma) a volcanic chain was formed of almost 120 km length, trending roughly NNW. This volcanic chain is made up by seven main vents, from north to south (Harmand and Cantagrel 1984, El Azzouzie et al. 2010). This Cenozoic volcanism in the Middle Atlas is exclusively of intraplate alkaline type and consists of a large number of strombolian cones and maars. The field is known as the Azrou volcanic field and covers a surface of ca. 960 km^2 (El Azzouzie et al 2010). Around 80 % of the Quaternary volcanism of the Middle Atlas is concentrated in the plateau between El Hajeb and Timahdite. In the north it extends into the plain of Sais, which largely owes its fertility to volcanogenic soils, in the south into the Haute Moulouya, in the east it extends through the Oued Guigou depression and there are some scattered volcanoes to the west (Moukadiri 1999). The petrologic map of the Middle Atlas in Figure 10 shows the different volcanic units and the ages of the volcanic rocks. Four types of mafic lavas have been identified in the Azrou volcanic field: nephelinites, basanites, alkali basalts and subalkaline basalts. During the Miocene only nephelinites erupted in the Middle Atlas whereas the basanites and basalts were exclusively extruded during the Pliocene and Quaternary. The nephelinites also erupted in the Quaternary (El Azzouzie et al. 2010).

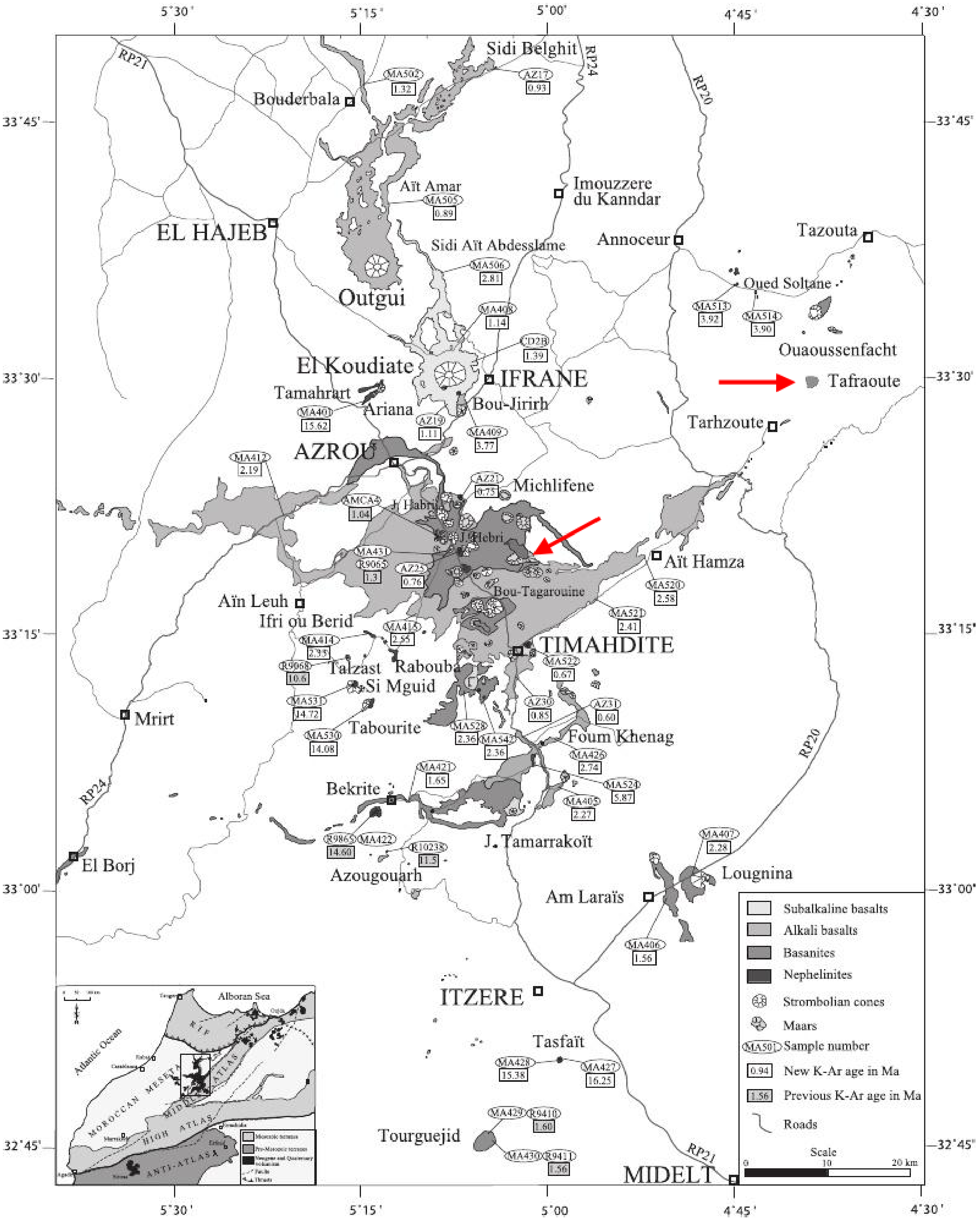


Figure 10 Petrologic map of the volcanic units in the Middle Atlas. It shows the locations and ages of K-Ar dated samples by Harmand and Cantagrel 1984, Morel and Bellon 1996 and El Azzouzie et al. 2010. The red arrows point to the locations studied in this thesis, Bou Ibalghatene and Tafraoute. (Modified after El Azzouzie et al. 2010)

Figure 11 Google Earth photo of the Middle Atlas. Azrou, Ifrane and Timahdite are indcated.

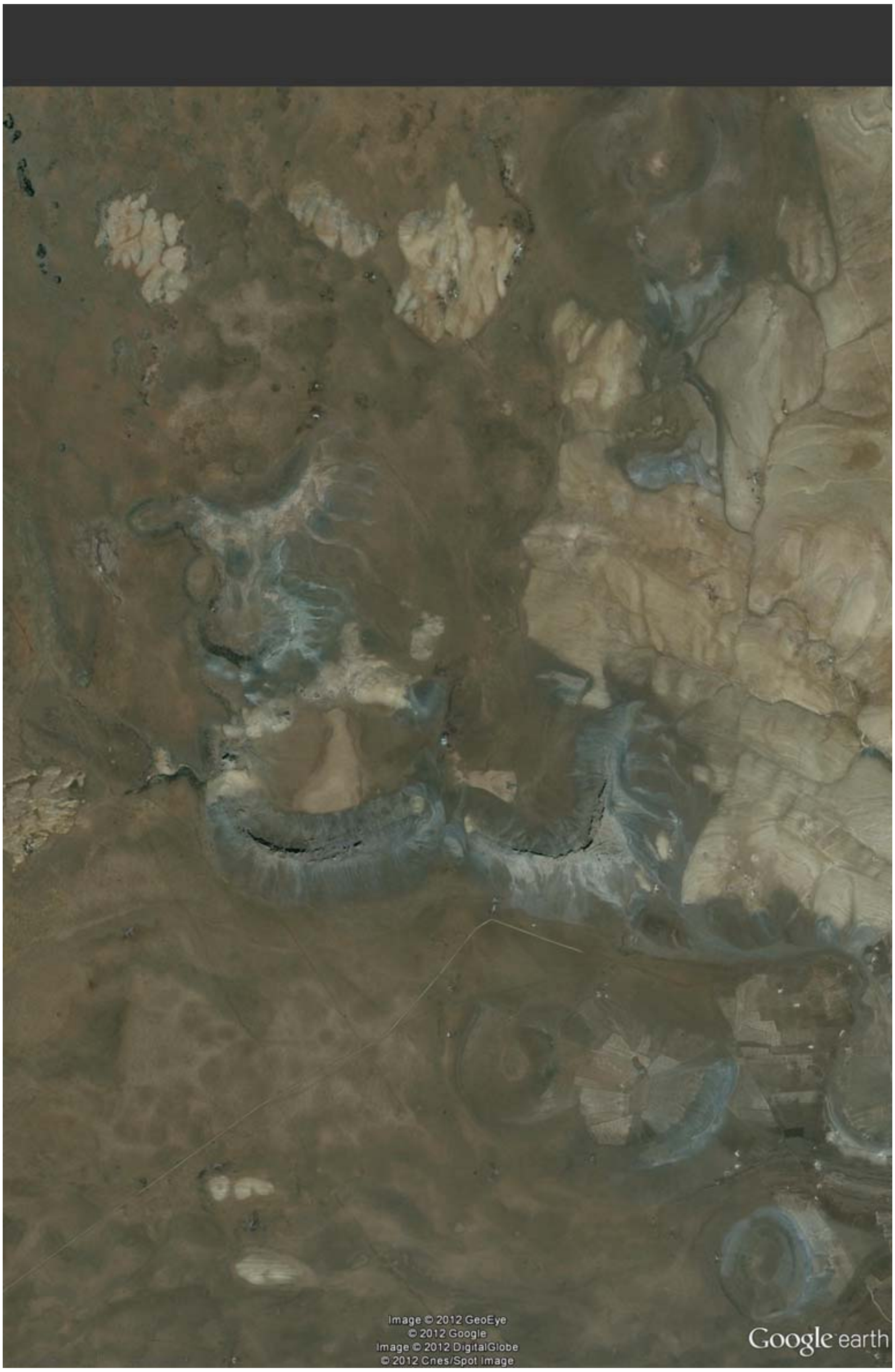


Figure 12 Google Earth photo of the maar of Bou Ibalghatene.

Bou Ibalghatene and Tafraoute

For this study xenoliths were collected from the maars of Bou Ibalghatene (Figure 12, Figure 13) and Tafraoute during fieldwork in October 2010. The localities are indicated with a red arrow in Figure 10. Bou Ibalghatene and Tafraoute erupted during the Pliocene to Quaternary as alkali basalts (Moukadiri and Bouloton 1998, Moukadiri and Pin 1998), enclosing numerous xenoliths. Both mantle and crustal xenoliths are found, but mantle xenoliths are more abundant. The mantle xenoliths can be divided into three classes: spinel peridotites, pyroxenites and amphibolites (Moukadiri 1999), that may all come from the same level. If the mantle xenoliths only come from the intermediate level (spinel peridotite) the deepest level (garnet peridotite) and the shallowest level (plagioclase peridotites) are absent. Based on the geochemistry of the mantle xenoliths it is thought that the lithosphere under the Middle Atlas was affected by metasomatism (Raffone et al. 2009, Wittig et al. 2010a,b). This metasomatic enrichement is younger than 200 Ma, based on Pb isotope evolution of clinopyroxenes, and is considered to be associated with the Quaternary intraplate volcanism in the Middle Atlas (Wittig et al. 2010b).

Granulitic xenoliths from Bou Ibalghatene and Tafraoute include mafic meta-igneous and (highly) aluminous metasedimentary rocks. These xenoliths have been equilibrated under lower crustal conditions. Based on their high Al content and high-T mineral assemblages, they are considered to represent the solid residue left behind during partial melting and extraction of a granitic magma (Moukadiri and Bouloton 1998, Moukadiri and Pin 1998, Moukadiri 1999).

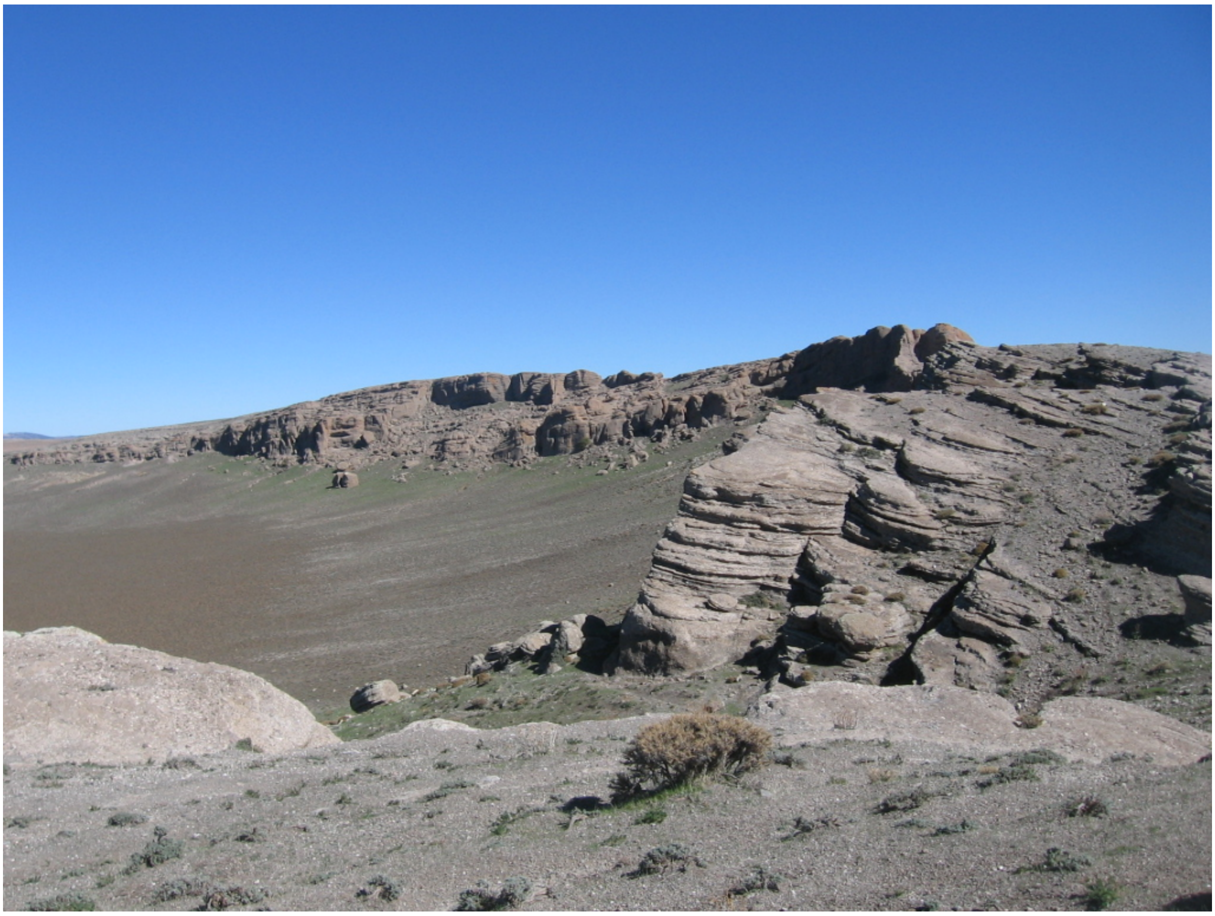


Figure 13 The maar of Bou Ibalghatene.

Crustal xenoliths

Our current knowledge of the deep continental crust is based on three different approaches: (i) exposed granulite terrains; (ii) geophysics; and (iii) lower crustal xenoliths (Kay and Kay 1981). The mineralogy, chemical composition, metamorphic facies, age and origin can differ vastly between different parts of a continent and are strongly dependent on tectonic settings and P-T deformation histories (Rudnick and Fountain 1995). The study of exposed lower crustal rocks has the advantage that on some continents they occur over vast, coherent regions up to hundreds of thousands of square kilometres. Examples are the Lewisian complex in Scotland (Wheeler et al. 2010) and the Eastern Ghats in India (Das et al. 2006) These terrains often record UHT metamorphism (Kelsey 2008). One major disdvantage, however, is that these terrains have had a long history to come to the surface, and they are generally modified by deformation and recrystallization on this retrograde path (Harley 2004, Das et al. 2006).

It is also possible to do indirect observations of the lower crust. This can be done by a number of geophysical techniques including deep seismic reflection profiling, gravimetry, tomography and electrical resistivity measurements (Fowler 2005). The third option is to study xenoliths from the lower crust (e.g., Zeck, 1970; Griffin et al. 1987, Downes 1993), which is also done in this thesis. A major advantage of crustal xenoliths is that, unlike exposed lower crustal terrains, they have generally been rapidly quenched during transport from the magma chamber to the surface in volcanic eruptions and are thus weakly affected by retrograde processes. Hence, they can give a better view of the prograde processes of lower crustal rocks (Braun and Kriegsman 2001; Kriegsman & Álvarez-Valero, 2010).

Aim of the project

The aim of this project is to study crustal xenoliths from the continental crust underneath the Middle Atlas. The xenoliths are collected from two maars in the Middle Atlas, Bou Ibalghatene and Tafraoute. The focus will lie on garnet-bearing crustal xenoliths. From these xenoliths a PT path can be derived which can give information on the early lower crustal evolution, and on the subsequent path of the xenolith in the magma. The focus will lie on the mineral reactions which can be seen in the xenoliths. With thermodynamic modeling software the PT conditions of these mineral reactions are identified, and together with thermobarometry a PT path will be constructed. Finally, some of the results will be compared to geological data of the area.

Results

Sample descriptions

Xenoliths have been collected from the maars of Bou Ibalghatene and Tafraoute. In both maars many mantle xenoliths were found, and a small number of crustal xenoliths. This study concentrates on the crustal xenoliths. The xenoliths are mostly rounded rock fragments, with a single more elongated fragment. Their diameter has an average of 8 cm, but it varies from 4 to 15 centimeters. The xenoliths are built up by a matrix of minerals, a few hundred microns in size, which define the overall microstructure of the xenolith. This matrix consists most frequently of pyroxene + plagioclase ± garnet for crustal xenoliths from Bou Ibalghatene, and sillimanite + plagioclase + garnet for crustal xenoliths from Tafraoute. In some samples the matrix forms a zoned or banded microstructure.

The xenoliths contain several mineral assemblages. The minerals which define the matrix form the main mineral assemblage. In some places it has been partly replaced by a second mineral assemblage, for example in a common symplectite rim around garnet grains. Inclusion phases in garnet, and occasionally in sillimanite, define an older mineral assemblage which preceded the main mineral assemblage.

There are four types of crustal xenoliths, three of which occur in Bou Ibalghatene and two in Tafraoute. The different types of crustal xenoliths are:

- orthogranulite without garnet (Bou Ibalghatene and Tafraoute)
- orthogranulite with garnet (Bou Ibalghatene)
- orthogranulite with garnet and orthopyroxene (Bou Ibalghatene)
- paragranulite with garnet and sillimanite (Tafraoute)

In Bou Ibalghatene only two xenoliths were found which contain garnet, and they are both from a different rock type. The orthogranulites without garnet do not show any mineral reactions and therefore do not give much information about the P-T path of the xenolith.

Mineral abbreviations

alm	almandine
amph	amphibole
an	anorthite
bt	biotite
cpx	clinopyroxene
crn	corundum

gro	grossular
grt	garnet
Kfs	K feldspar
liq	liquid
ol	olivine
opx	orthopyroxene
pl	plagioclase
py	pyrope
qtz	quartz
rt	rutile
sill	sillimanite
spl	spinel
TiMa	titanomagnetite
V	vapour

Thin section descriptions

TA-31:

Sample TA-31 is a xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + rt + bt. Three large, 0.7 mm, corundum grains are present in the thin section. Inclusions found in the thin section are spinel, sillimanite, titanomagnetite, rutile and probably plagioclase and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

BG-22

Sample BG-22 is a mantle xenolith of the type pyroxenite from Bou Ibalghatene. The main mineral assemblage consists of: opx + cpx + amph + TiMa + rt. Mantle xenoliths are not further studied in this thesis.

BG-24

Sample BG-24 is a mantle xenolith of the type pyroxenite from Bou Ibalghatene. The main mineral assemblage consists of: opx + cpx + bt (+amph?). The presence of amphibole could not be confirmed by optical microscopy. Mantle xenoliths are not furher studied in this thesis.

BG-32

Sample BG-32 is a mantle xenolith of the type pyroxenite from Bou Ibalghatene. The main mineral assemblage consists of: opx + cpx + ol + amph. Mantle xenoliths are not further studied in this thesis.

BG-33

Sample BG-33 is a mantle xenolith of the type spinel peridotite from Bou Ibalghatene. The main mineral assemblage consists of: pl + spl + opx + ol. Mantle xenoliths are not further studied in this thesis.

BG-11

Sample BG-11 is a crustal xenolith of the type orthogranulite without garnet from Bou Ibalghatene. The main mineral assemblage consists of pl + opx + cpx + TiMa + bt.

BG-12

Sample BG-12 is a crustal xenolith of the type orthogranulite without garnet from Bou Ibalghatene. The main mineral assemblage consists of pl + opx + cpx + TiMa + bt.

BG-18

Sample BG-18 is a crustal xenolith of the type orthogranulite without garnet from Bou Ibalghatene. The main mineral assemblage consists of pl + opx + cpx + TiMa.

BG-2

Sample BG-2 is a crustal xenolith of the type orthogranulite with garnet and orthopyroxene from Bou Ibalghatene. The main mineral assemblage consists of: opx + pl + Kfs + grt + qtz (+bt?). The orthopyroxene grains in the main mineral assemblage are large. It is the only crustal xenolith containing garnet and orthopyroxene in the main mineral assemblage. Inclusions found in the thin section are plagioclase, titanomagnetite and possibly quartz (not confirmed with analyses). The sample has large garnet grains surrounded by symplectites of spinel, plagioclase and orthopyroxene.

BG-4

Sample BG-4 is a crustal xenolith of the type orthogranulite with garnet from Bou Ibalghatene. The main mineral assemblage consists of: pl + grt + zn-spl + crn + TiMa. Large corundum, spinel and titanomagnetite grains are found in the thin sections. The spinel grains in the thin sections are dark green to black. Inclusions found in the thin sections are titanomagnetite and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase, orthopyroxene and in some places olivine.

BG-7

Sample BG-7 is a crustal xenolith of the type orthogranulite without garnet from Bou Ibalghatene. The main mineral assemblage consists of pl + opx + TiMa (+cpx?). The presence of clinopyroxene could not be confirmed by optical microscopy.

BG-8

Sample BG-8 is a crustal xenolith of the type orthogranulite without garnet from Bou Ibalghatene. The main mineral assemblage consists of pl + opx + amph (+qtz?). The presence of quartz could not be confirmed by optical microscopy.

BG-23

Sample BG-23 is a crustal xenolith of the type orthogranulite without garnet from Bou Ibalghatene. The main mineral assemblage consists of pl + opx.

LKPTAF-4

Sample LKPTAF-4 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + bt. Inclusions found in the thin section are spinel, sillimanite, quartz, titanomagnetite and possibly plagioclase (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-14

Sample TA-14 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are titanomagnetite and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-20

Sample TA-20 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + rt. Inclusions found in the thin section are titanomagnetite, rutile and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-21

Sample TA-21 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are titanomagnetite, rutile and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-22

Sample TA-22 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are titanomagnetite and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-23

Sample TA-23 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + bt. Inclusions found in the thin section are titanomagnetite and possibly plagioclase, spinel, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-24

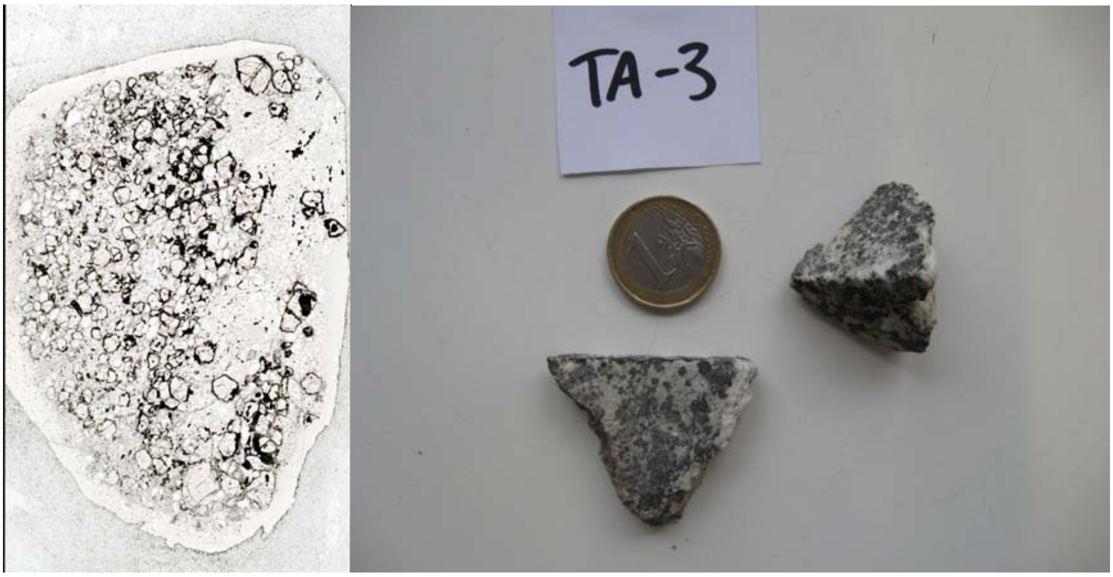
Sample TA-24 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are titanomagnetite, rutile and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-38

Sample TA-38 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are spinel, sillimanite, quartz, titanomagnetite and possibly plagioclase (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-15

Sample TA-15 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + rt. Inclusions found in the thin section are titanomagnetite and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

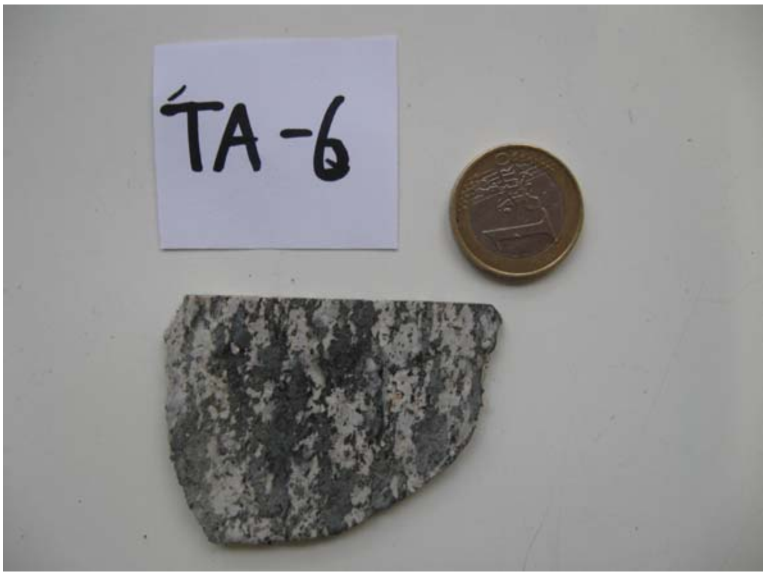


PTAF-3

Sample PTAF-3 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt + bt. Inclusions found in the thin section are spinel, titanomagnetite, rutile and possibly plagioclase, sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-30

Sample TA-30 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + rt. Inclusions found in the thin section are quartz and titanomagnetite. Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.



PTAF-6

Sample PTAF-6 is a crustal xenolith of the type orthogranulite without garnet from Tafraoute. The main mineral assemblage consists of: pl + opx + TiMa + bt.

TA-10

Sample TA-10 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are sillimanite, titanomagnetite, rutile and possibly plagioclase and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-11

Sample TA-11 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are sillimanite, plagioclase, titanomagnetite and possibly quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-12

Sample TA-12 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + rt. Inclusions found in the thin section are spinel, quartz, titanomagnetite and possibly plagioclase and sillimanite (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-13

Sample TA-13 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + rt. Inclusions found in the thin section are rutile and possibly sillimanite and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-16

Sample TA-16 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are sillimanite, titanomagnetite and possibly plagioclase and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-17

Sample TA-17 is a crustal xenolith of the type orthogranulite without garnet from Tafraoute. The main mineral assemblage consists of: pl + opx + cpx + TiMa.

TA-18

Sample TA-18 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + qtz + rt. Inclusions found in the thin section are sillimanite, quartz, titanomagnetite, rutile and possibly plagioclase (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

TA-25

Sample TA-25 is a crustal xenolith of the type orthogranulite without garnet from Tafraoute. The main mineral assemblage consists of: pl + opx + cpx + TiMa + bt.

TA-27

Sample TA-27 is a crustal xenolith of the type orthogranulite without garnet from Tafraoute. The main mineral assemblage consists of: pl + opx + cpx + TiMa.

TA-29

Sample TA-18 is a crustal xenolith of the type paragranulite with garnet and sillimanite from Tafraoute. The main mineral assemblage consists of: sill + grt + pl + TiMa + rt. Skelettal biotite is found in the thin section. Inclusions found in the thin section are sillimanite, titanomagnetite, rutile and possibly plagioclase and quartz (not confirmed with analyses). Garnet grains are surrounded by symplectites of spinel, plagioclase and orthopyroxene.

Mineral content

Scans of all thin sections made from the xenoliths are in the appendices. Table 1 gives the mineral content of all samples ad indicates where the mineral is present, either in the matrix, in the symplectite, as an inclusion or a combination of these options. The minerals have been identified via optical microscopy, WDS analyses and EDS analyses (see methods section). Minerals with a question mark are thought to be present in the thin section but lack a 100% identification, e.g., through EM analysis. This was partly because they were too small for optical identification and partly because not all thin sections and minerals could be analysed. However, in these cases there is some evidence that suggests that the mineral is present, for example a simillar mineral in another thin section that has been analysed.

In the table it can be seen that plagioclase is present in all crustal samples, as a phase in the main assemblage forming the matrix. It is also found as inclusions in garnet, but only for a few samples it has been confirmed by analyses that the inclusion is indeed plagioclase.

In all samples where garnet is present it is surrounded by a symplectite containing plagioclase, spinel and orthopyroxene. Sample BG4 also shows titanomagnetite (TiMa) and olivine as additional phases in the symplectite.

Orthopyroxene is present in all samples, either as mineral in the matrix or in the symplectite. Sample BG2 is the only sample where garnet and orthopyroxene are both present as major phases in the matrix. In the other samples containing garnet, orthopyroxene is only found in the symplectite.

Sillimanite is present as a major phase in the matrix in paragranulite rocks from Tafraoute. One sample from Bou Ibalghatene shows minor sillimanite, as inclusions in garnet. In Tafraoute the sillimanite is found both in the matrix and also as inclusions in garnet.

Spinel is only found as a major phase in the matrix of the crustal xenoliths in sample BG4. It is found in symplectites in all samples containing garnet. In Tafraoute spinel also forms inclusions in garnet.

Titanomagnetite, rutile and biotite are found both in Tafraoute and Bou Ibalghatene in most samples as accesory minerals in the matrix. Only titanomagnetite and rutile are also found as inclusions in garnet.

Mineral descriptions

Garnet

Garnet grains occur both in Bou Ibalghatene and Tafraoute. In Bou Ibalghatene only two rocks with garnet were found, but in Tafraoute garnet bearing xenoliths are more common. In all samples the garnets are surrounded by a symplectite of orthopyroxene, spinel and plagioclase plus, in one case, olivine . This symplectite follows the original outline of the garnet (Figure 14C). In Tafraoute garnet coexists with sillimanite in the matrix. It appears that garnet and sillimanite formed together as intergrowths (Figure 14A,B). The original garnet shape is usually rounded but slightly elongate garnet grains also exist (Figure 15A,B). The garnet grains are approximately 0.2-2.0 mm in size on average. The thickness of the symplectite differs from sample to sample. In some xenoliths it only forms a thin rim on garnet (Figure 14A), whereas in some other samples almost the whole garnet grain has dissapeared (Figure 14C). Garnet also contains many inclusions (Figure 16, Figure 17D,Figure 18C) and these inclusions are sometimes surrounded by a symplectite rim (Figure 14D). The minerals found as inclusions are, plagioclase, spinel, sillimanite, quartz, titanomagnetite and rutile (Table 1). The inclusions are usually rounded, but some of the sillimanite inclusions are more elongate. Many garnet grains also show cracks transecting the grain, where in most cases a symplectite is developed (Figure 14E, Figure 17D).

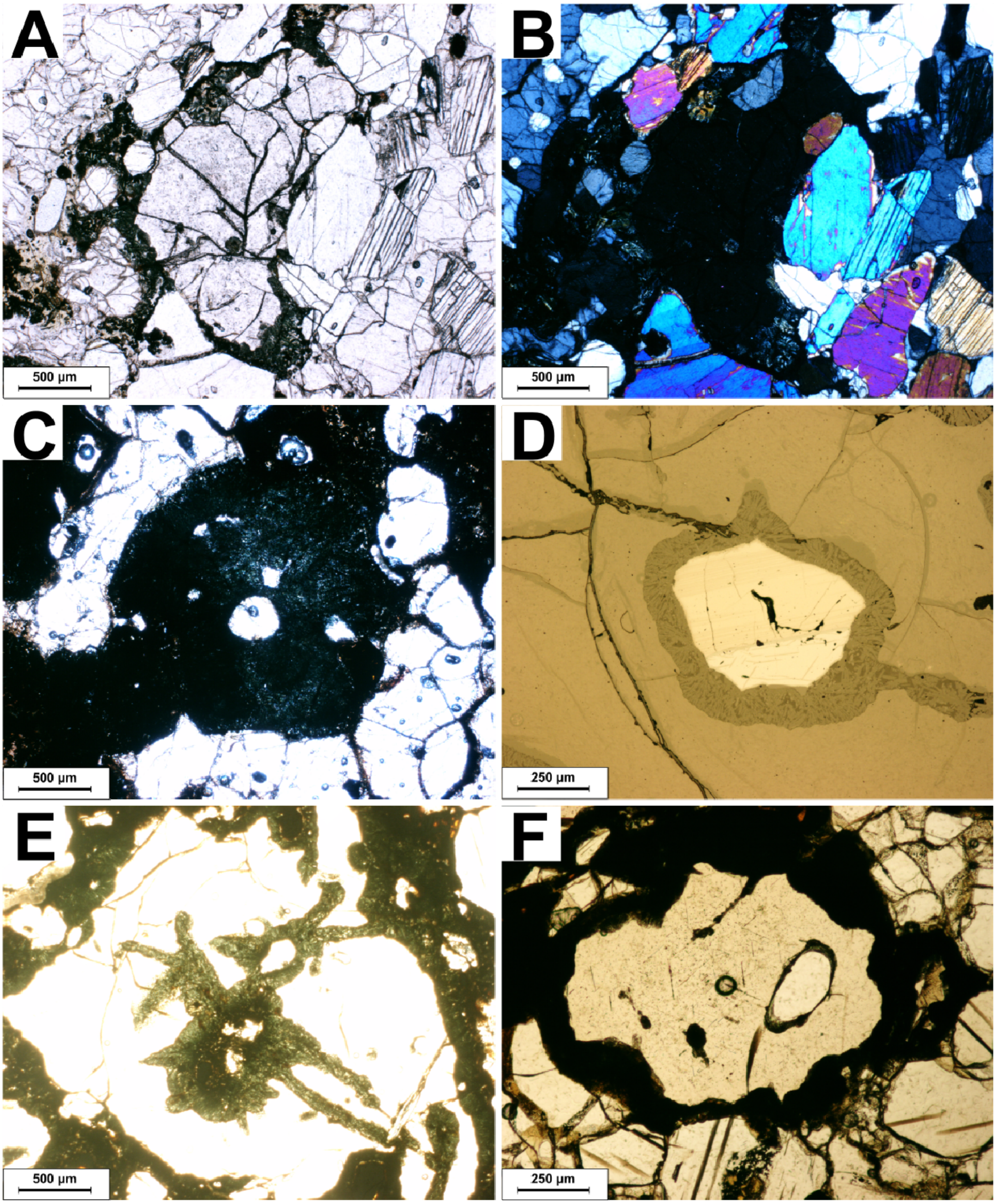


Figure 14 A Sample LKTA22. Garnet intergrown with prismatic sillimanite. There is a small symplectite around the garnet, photograph taken with transmitted light.B photograph taken with cross polarised light of A C Photograph with transmitted light of sample PTAF30. Garnet almost completely altered to symplectite. There are some inclusions left in the garnet. D Photograph with reflected light of sample TA18 showing a titanomagnetite inclusion in garnet. Around the titanomagnetite a symplectite is developed that consists of orthopyroxene plagioclase and spinel. E Photograph with transmitted light of sample TA10 showing a garnet

with some inclusions. symplectites have developed around garnet, around inclusions and along cracks in garnet. F Photograph with transmitted light of Sample TA18. Rounded garnet + symplectite surrounded by sillimanite. Also a large rounded inclusion of probably sillimanite is seen inside the garnet.

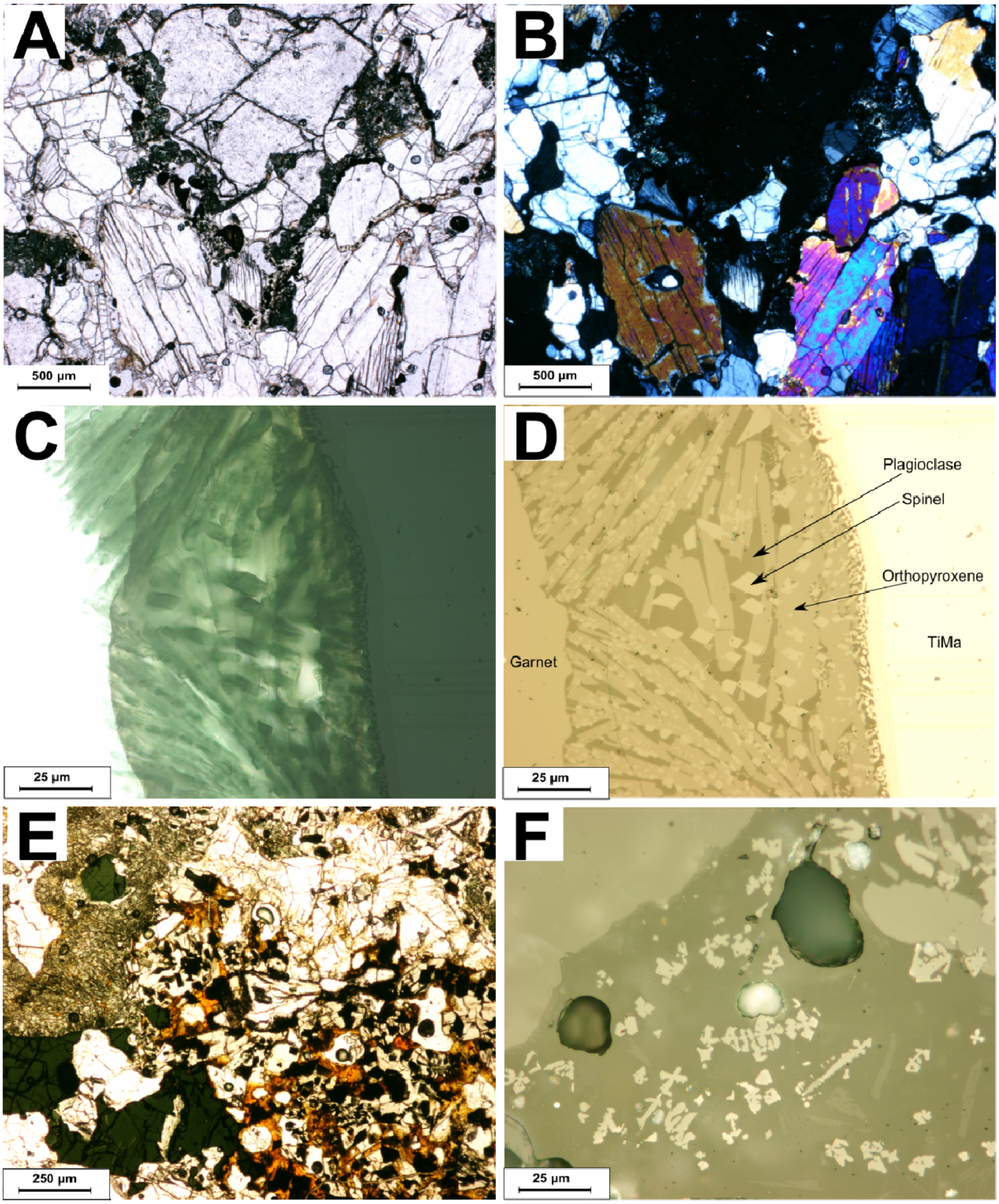


Figure 15 A Sample LKTA22, slightly elongated garnet intergrown and surrounded by sillimanite. Photograph taken with transmitted light. B photograph taken with cross polarised light of A. C Sample TA18, symplectite of orthopyroxene, plagioclase and spinel. Spinel is

responsible for the green colour of the symplectite. Photograph taken with transmitted light. D Sample TA18, symplectite of orthopyroxene, plagioclase and spinel. The structure of the symplectite can be seen clearly. Photograph taken with reflected light. E Sample BG4, large dark green spinel grains, together with garnet with a large symplectite. Also a large spinel grain is present in the symplectite, probably an old garnet inclusion. Next to the symplectite and spinel also corundum is present. Photograph taken with transmitted light F Sample TA11, part of a symplectite showing snowflake spinel. Photograph taken with reflected light.

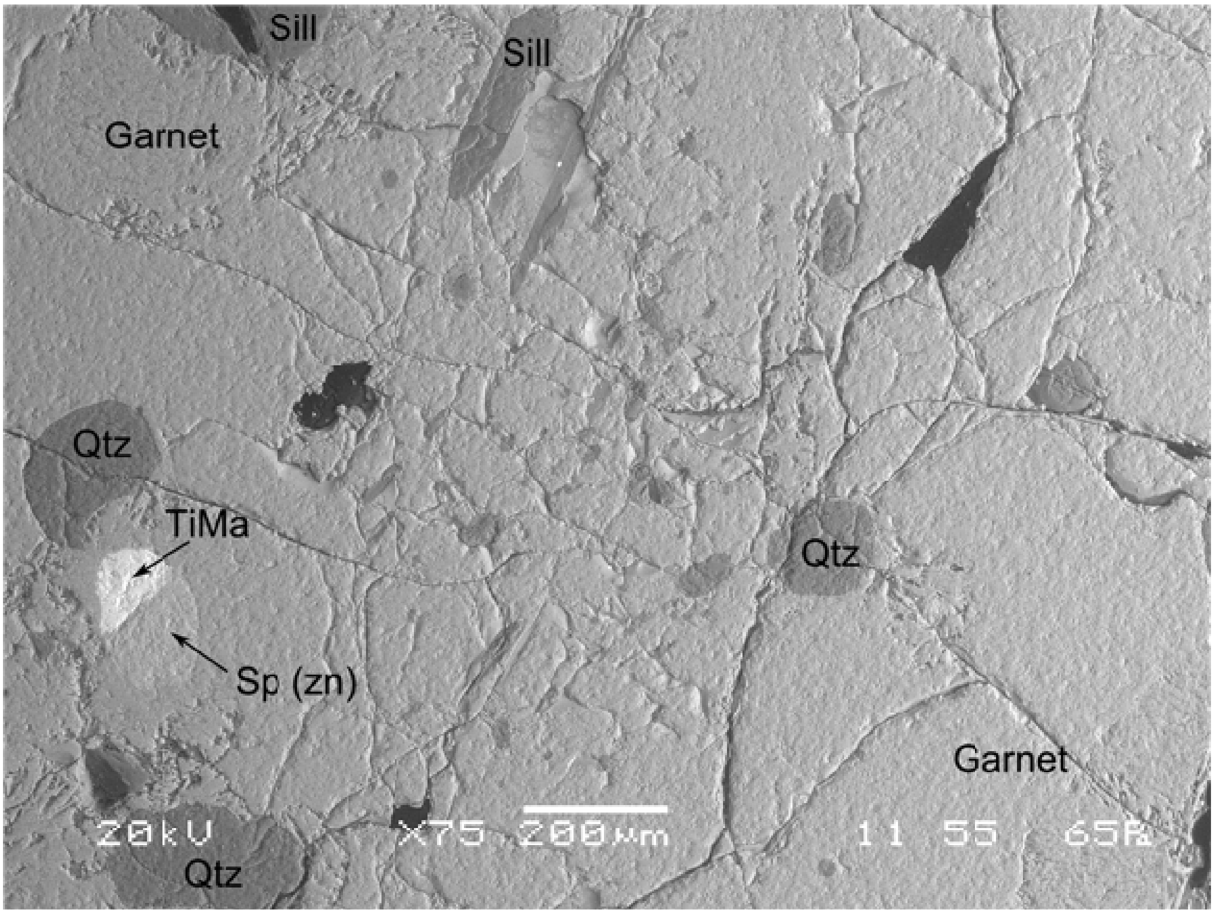


Figure 16 SEM photograph of sample LKPTAF4. Garnet grain with inclusions of sillimanite, quartz, titanomagnetite and zinc-rich spinel. Minerals identified with WDS.

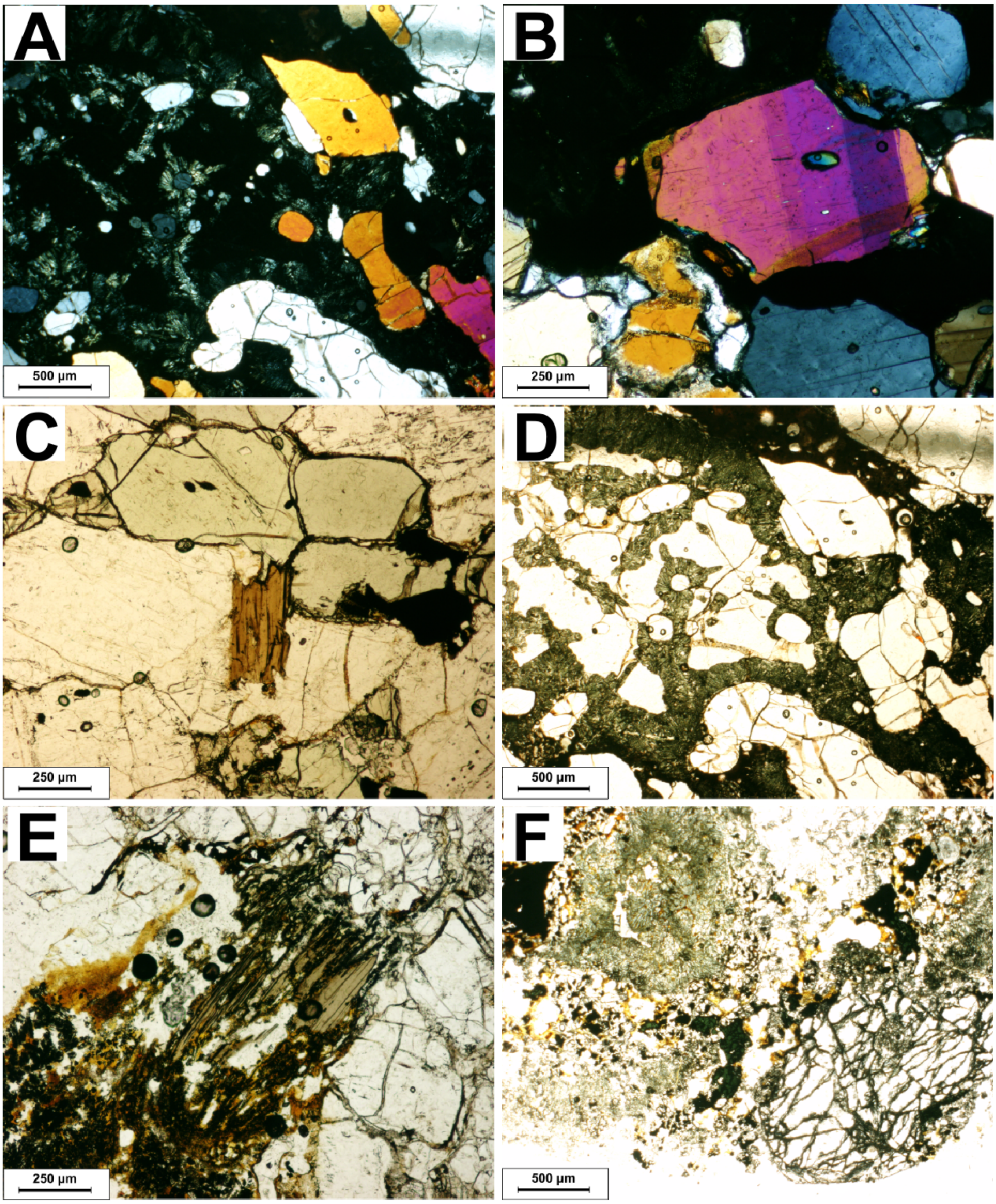


Figure 17 A Sample TA16, garnet with inclusions, surrounded by a symplectite. Symplectite also around the inclusions and in cracks transecting the garnet grain. Photograph taken with cross polarised light. B Sample TA18, large sillimanite grain showing kink bands. Photograph taken with cross polarised light. C Sample BG12, biotite, orthopyroxene and plagioclase stable together. Photograph taken with transmitted light. D Photograph taken with transmitted light of A. E Sample BG2, biotite breaking down. Photograph taken with transmitted light. F

Sample BG4, large corundum grain, next to some large dark green spinel fragments. Garnet is next to it with a large symplectite. Photograph taken with transmitted light.

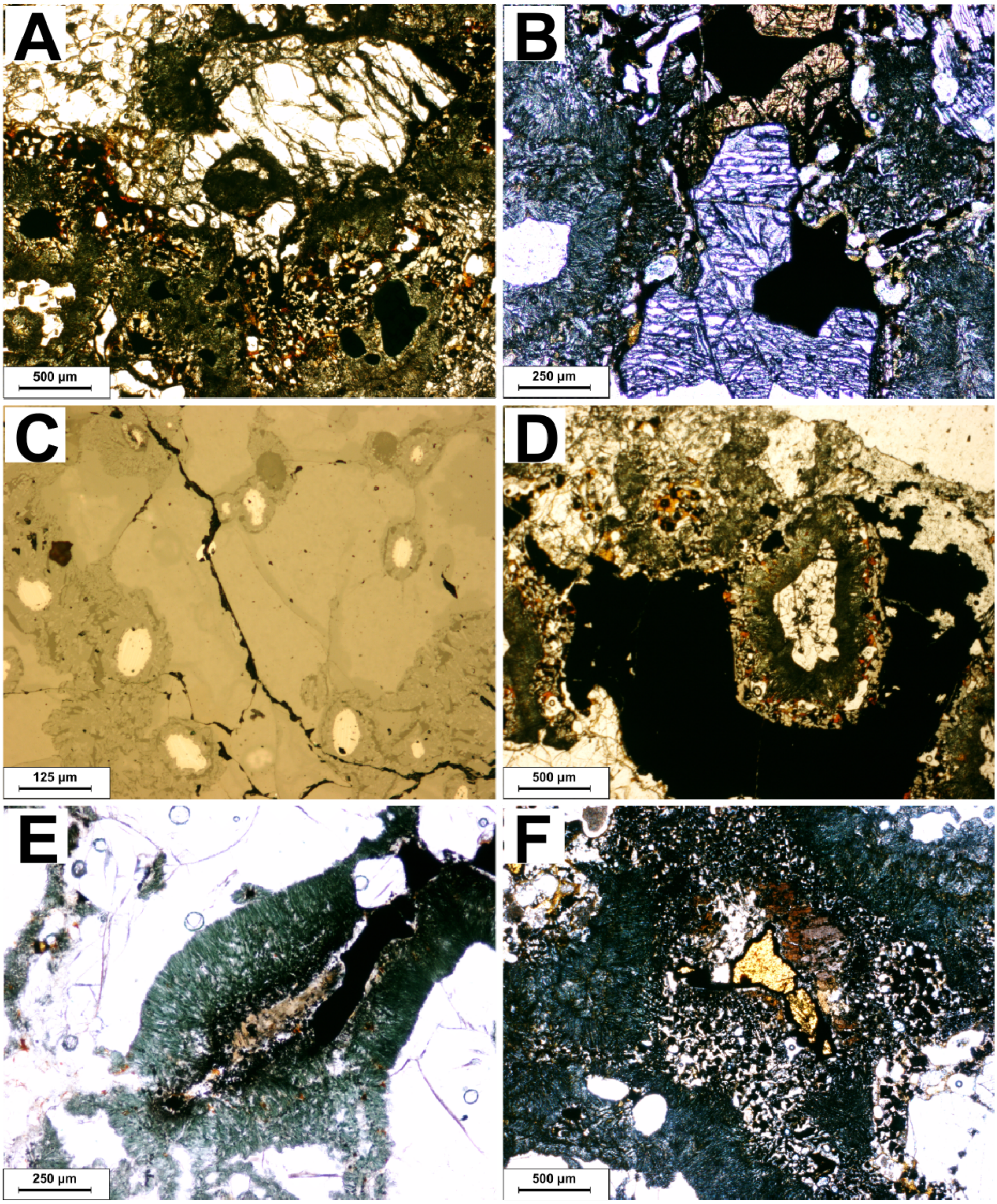


Figure 18 A Sample BG4, large corundum grain stable together with spinel and garnet. Garnet has thick symplectites, with rounded spinel incorporated in the symplectite. Photograph taken with transmitted light. B Sample TA31, large corundum grain next to garnet with a large symplectite. Above the corundum grain a rutile grain is present. C Sample TA11, garnet with a number of rounded titaniummagnetite, also some other inclusions are

present. Photograph taken with reflected light. D Sample BG4, garnet with a large symplectite, surrounded by a large titaniummagnetite. Photograph taken with Transmitted light. E Sample PTAF3, biotite grain breaking down in between two garnet grains with symplectite. Photograph taken with transmitted light. F Sample TA31, biotite grain breaking down next to rutile, surrounded by garnet grains with symplectite. Photograph taken with transmitted light.

Feldspar

Feldspar is found in all crustal xenoliths in the main mineral assemblage forming an important part of the matrix. The feldspar is generally a mix of K-feldspar and plagioclase. It is also found in the symplectite around the garnet grains and as inclusion in garnet. The average size of matrix feldspar is 0.5-1.5 mm. The feldspar in the symplectite is only a few microns in size. Inclusions of feldspar are around 30-200 microns. In some samples plagioclase shows exsolved patches of orthoclase and orthoclase shows exsolved patches of plagioclase (Figure 19). When the compositions are integrated, both phases are different ternary feldspars.

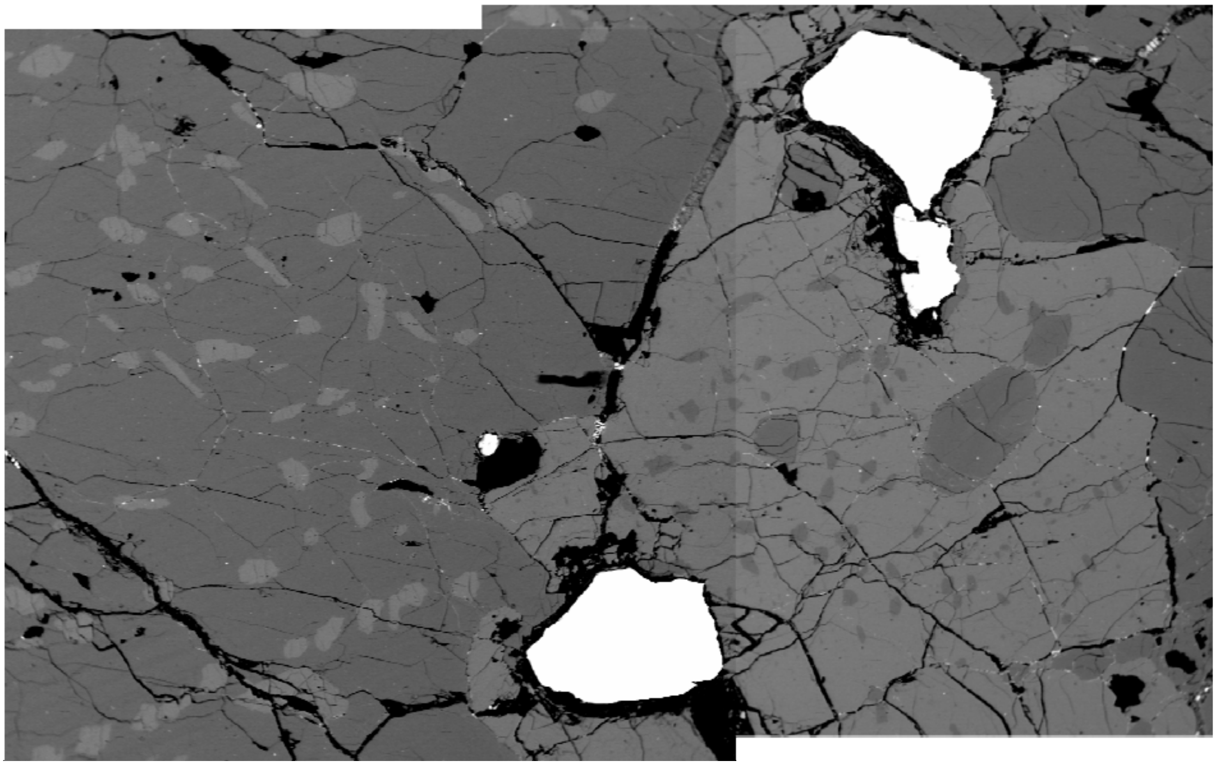


Figure 19 Microprobe photographs of sample LKTA38. Right plagioclase with orthoclase exsolution patches. Left orthoclase with plagioclase exsolution patches.

Spinel

Spinel is present in all samples in the symplectite rimming garnets. It is also present in one sample from Bou Ibalghatene as a major matrix phase. In Tafraoute spinel locally forms inclusions in garnet and also forms large patches surrounded by the symplectite rimming garnet. The two types of spinel are optically easy to recognise. In the symplectite the spinel grains are only a few microns in size and generally have rectangular shapes. They are light green and are responsible for the colour of the symplectite (Figure 15C). In a few samples spinel from the symplectite has a special shape with crosses resembling snowflakes (Figure 15F), which indicates fast crystallisation. The spinel grains in the symplectite tend to be concentrated alongside orthopyroxene grains. The other spinel grains are much larger, 0.2-0.8 mm in sample BG4, and 50-700 microns as inclusions. This spinel type is dark green to almost black (Figure 15E). The spinels in BG4 are more angular (Figure 15E) and appear to be fragments of originally larger spinel grains. The spinel inclusions are more rounded (Figure 16, Figure 18A).

Orthopyroxene

Orthopyroxene is present in all samples. It occurs in the matrix in the orthogranulite samples without garnet and in the orthogranulite sample with garnet and orthopyroxene (sample BG2) from Bou Ibalghatene. It is also a major phase in the symplectites rimming garnet. Sample BG2 is the only one where orthopyroxene is found in the matrix together with garnet; This orthopyroxene type is stubby (thin section scan). In the orthogranulite samples lacking garnet orthopyroxene is one of the largest and most abundant phases, with an average size of 0.2-1.0 mm. The orthopyroxene found in the symplectite is elongate with a length up to 0.1 mm in length and up to 20 microns in width (Figure 15D). It generally shows a constant orientation within small microdomains (up to 0.5 mm in size), but varies between microdomains (Figure 15D).

Sillimanite

Sillimanite is only present as a major matrix phase in Tafraoute which also contains garnet (Table 1). These sillimanite grains are large, 0.3-1.5 mm in size, and are mostly elongated (Figure 15A, B). These prismatic sillimanite grains often display kink bands suggesting high-T deformation and high-T recrystalisation (Kriegsman 1994) (Figure 17B). Sillimanite grains sometimes occur in intergrowths with garnet (Figure 14A, B). Sillimanite is also found as inclusions in garnet where it is mostly elongated but in a few cases rounded. Sillimanite seems to be present in Bou Ibalghatene as an inclusion in garnet grains from sample BG4, but this has not been confirmed by analyses.

Biotite

Biotite is present in some samples as an accessory mineral. In the orthogranulite samples without garnet it is present in the matrix and seems to be stable (Figure 17C). In the samples containing garnet, biotite is present in the matrix and has partly broken down to orthopyroxene, titanomagnetite plus sometimes spinel and K-feldspar (Figure 17E). The average size of biotite is 0.2-0.7 mm. In one sample it seems that biotite break-down reaction products have the shape of garnet, and thus originally biotite has grown at the expense of garnet. The biotites are pleochroic and are brown to dark brown.

Corundum

Corundum is found in sample BG4 from Bou Ibalghatene and sample TA31 from Tafraoute. In sample BG4 corundum is a major phase, showing large fragments with sizes ranging from 0.5-1.5 mm. In some places the fragments are in optical continuity and appear to be part of a larger corundum grain (Figure 17F, Figure 18A). Sample TA31 shows three corundum fragments (Figure 18B) with a size of 0.7 mm.

Titanomagnetite

Titanomagnetite is present in most samples (Table 1). Its average size is 0.2-1.0 mm for grains present in the matrix and 0.1-0.5 mm for grains enclosed by garnet. The titanomagnetite in the matrix is sometimes more angular (Figure 18D) whereas the titanomagnetite inclusions are always rounded (Figure 18C). Many titanomagnetite grains show ilmenite exsolution lamellae (Figure 14D). Sample BG4 contains larger grains of up to 5mm in size, titanomagnetite is also present in some of the symplectites.

Rutile

Rutile is present in all garnet bearing samples from Tafraoute except LKPTAF4. It is present in the matrix and in some samples also forms inclusions in garnet. The rutile grains have an average size of 0.1-0.5 mm and are usually angular (Figure 18B). It has a dark gold brown colour (Figure 18F) and is sometimes slightly pleochroic.

Quartz

Quartz is sometimes present in the matrix and also as inclusions in garnet. In the matrix it has an average size of 50-500 microns. Quartz inclusions in garnet are rounded and have an average size of 50-300 microns (Figure 16).

Olivine

Olivine is only present in one crustal xenolith (sample BG4) from Bou Ibalghatene. There it occurs in the outer margin of a symplectite rimming garnet. It is not in contact with garnet. Its size is only a few microns and its shape is rectangular Figure 20.

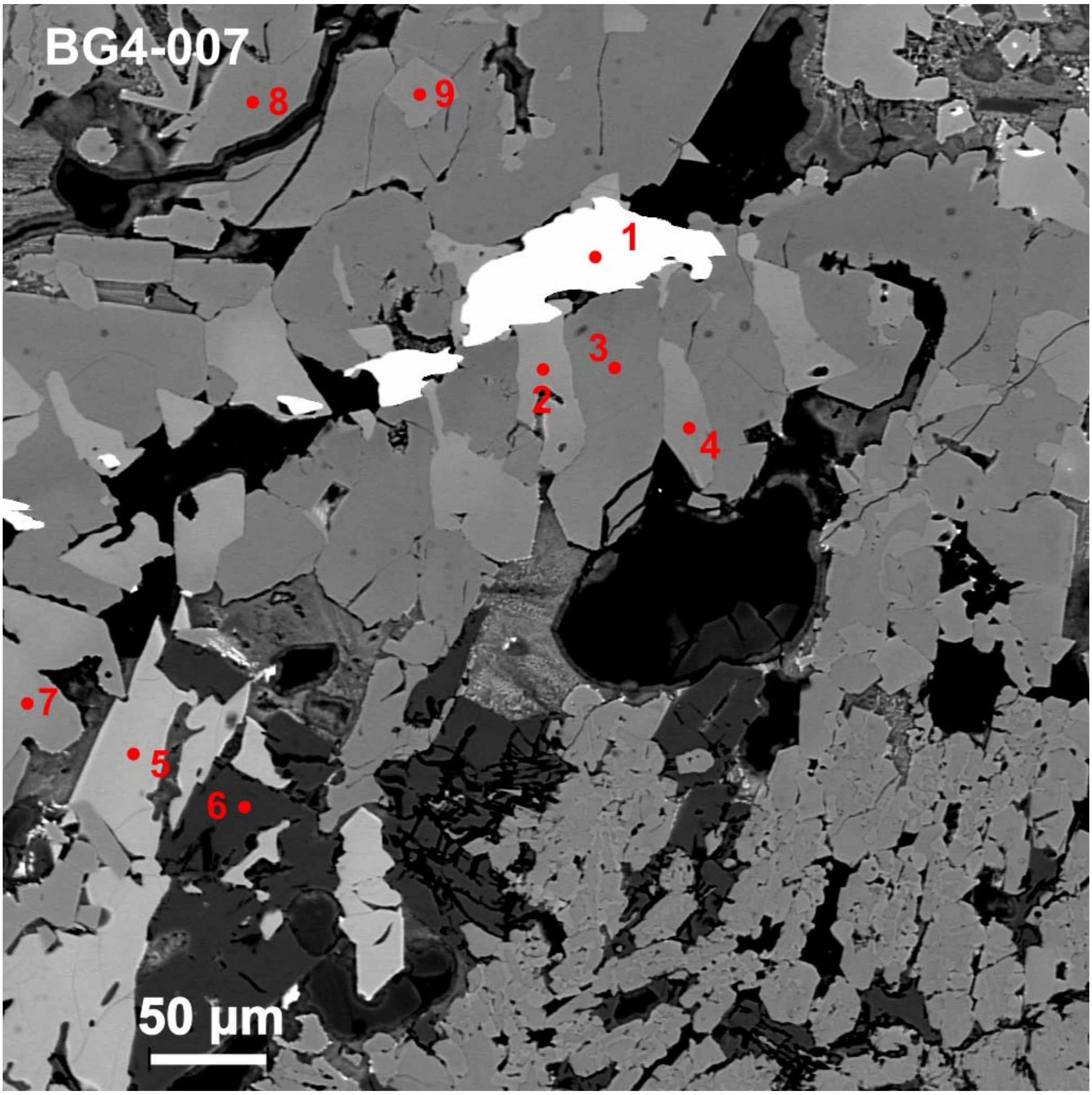


Figure 20 Microprobe image of a symplectite in sample BG4. This symplectite contains some olivine (nr. 5).

Clinopyroxene

Clinopyroxene is only present in some orthogranulite samples without garnet. Here it is present in the matrix, with an average size of 0.2-1.5 mm.

Amphibole

Amphibole in the crustal xenoliths is only present in sample BG8. It is present in the matrix, with an average size of 0.5-1.0 mm.

Thin section	Sample Nr	pl	grt	spl	sill	opx	cpx	ol	qtz	amph	TiMa	rt	bt	crn
Bou Ibalghatene														
Mantle														
BG-22	BG-22					X	X			X	X	X		
BG-24	BG-24					X	X			?			X	
BG-32	BG-32					X	X	X		X				
BG-33	BG-33	X		X		X		X						
Crustal														
BG-11	BG-11	X				X	X				X		X	
BG-12	BG-12	X				X	X				X		X	
BG-18	BG-18	X				X	X				X			
BG-7	BG-7	X				X	?				X			
BG-8	BG-8	X				X			?	X				
LKBIG-23	BG-23	X				X								
BG-2	BG-2	X, I	X	S		X, S			X, I?		X, I		X	
BG-2B	BG-2	X, I?	X	S		X, S			X, I?		X, I		X	
BG-2C	BG-2	X, I	X	S		X, S			X, I?		X, I		X	
BG-4	BG-4	X, S, I?	X	X, S	I?	S		S	I?		X, S, I			X
BG-4B	BG-4	X, S, I?	X	X, S	I?	S		S	I?		X, S, I		X	X
BG-4C	BG-4	X, S, I?	X	X, S	I?	S		S?	I?		X, S, I		X	X
Tafraoute														
Crustal														

PTAF-6	PTAF-6	X				X					X		X	
TA-17	TA-17	X				X	X				X			
TA-25	TA-25	X				X	X				X		X	
TA-27	TA-27	X				X	X				X			
LKPTAF-4	LKPTAF-4	X, S, I?	X	S, I	X, I	S			I		X, I		X	
LKTA-14	TA-14	X, S, I?	X	S	X, I?	S			X, I?		X, I	X		
LKTA-20	TA-20	X, S, I?	X	S	X, I?	S			I?		X, I	X, I		
LKTA-21	TA-21	X, S, I?	X	S	X, I?	S			X, I?		X, I	X, I		
LKTA-22	TA-22	X, S, I?	X	S	X, I?	S			X, I?		X, I	X		
LKTA-23	TA-23	X, S, I?	X	S, I?	X, I?	S			X, I?		X, I		X	
LKTA24	TA-24	X, S, I?	X	S	X, I?	S			X, I?		X, I	X, I		
LKTA-38	TA-38	X, S, I?	X	S, I	X, I	S			X, I		X, I	X		
PTAF-15	TA-15	X, S, I?	X	S	X, I?	S			I?		X, I	X		
PTAF-3	PTAF-3	X, S, I?	X	S, I	X, I?	S			X, I?		X, I	X, I	X	
PTAF-30	TA-30	X, S	X	S	X	S			I		X, I	X		
TA-10	TA-10	X, S, I?	X	S	X, I	S			X, I?		X, I	X, I		
TA-11	TA-11	X, S, I	X	S	X, I	S			X, I?		X, I	X		
TA-12	TA-12	X, S, I?	X	S, I	X, I?	S			I		X, I	X		
TA-13	TA-13	X, S	X	S	X, I?	S			I?		X	X, I		
TA-16	TA-16	X, S, I?	X	S	X, I	S			X, I?		X, I	X		
TA-18	TA-18	X, S, I?	X	S	X, I	S			X, I		X, I	X, I		
TA-29	TA-29	X, S, I?	X	S	X, I	S			I?		X, I	X, I	skelettal	

TA-31	TA-31	X, S, I?	X	S, I	X, I	S			I?		X, I	X, I	X	X
Thin section	Sample Nr	pl	grt	spl	sill	opx	cpx	ol	qtz	amph	TiMa	rt	bt	crn

Table 1 Minerals identified in the thin sections. X: present in matrix. S: present in symplectite. I: present as inclusion. ?:not identified, but there is some evidence that suggests that the mineral is present.

Mineral assemblages

The xenoliths record a number of mineral assemblages. They can be divided into three groups. The first group is the main mineral assemblage which forms the matrix of the xenolith. The second group of mineral assemblages are the reaction products. Phases of the main mineral assemblage show several types of mineral reactions, that produce new mineral assemblages. The last group of mineral assemblages are the old assemblages which where stable prior to the main mineral assemblage. They are mostly present as inclusions in minerals in the main mineral assemblage, or as relict minerals in the matrix.

Main mineral assemblage

The main mineral assemblage consists of the, generally coarse grained, minerals making up the matrix of the xenolith. The xenoliths show four different main assemblages. Three occur in Bou Ibalghatene, and two in Tafraoute. The main mineral assemblages observed in Bou Ibalghatene are:

- opx + pl ± cpx ± TiMa ± bt (BG 7,8,11,12,18,23 and TA17,25,27 PTAF6) (meta-basite)
- opx + pl + Kfs + grt + qtz (+bt?) (BG2) (charnockite)
- pl + grt + zn-spl + crn + TiMa (BG4) (restite)

And the main mineral assemblage found in Tafraoute is:

- sill + grt + pl + TiMa + rt ± bt (TA10-16,18,20-24,29-31,38, PTAF3 and LKPTAF4) (meta-pelite)

Reaction assemblages

Phases of the main mineral assemblages produce new mineral assemblages by a number of reactions. These reactions are;

- symplectite formation gt => spl + pl + opx (+ol, one case, BG4) (Figure 15C, D)
- biotite breakdown bt => opx + TiMa ± spl ± Kfs (+liq or V) (Figure 17E, Figure 18E, F)

Symplectite formation

Garnet in all samples breaks down to form a symplectite of fine-grained spinel, plagioclase and orthopyroxene, the most common reaction in the xenoliths. The symplectite has replaced the outer rim of almost all garnet grains. Together they show the original garnet shape(Figure 14C). The thickness of the symplectite rim differs per sample. In some samples it is only a 20 micron small rim, whereas in other samples it consumes most of the 0.1-0.5 mm sized garnet. The symplectite has not only formed at the garnet edge but also inside garnet grains around some inclusions and along cracks in the garnet, which may suggest it is triggered by fluid or melt influx. The symplectite has a patchy appearance with microdomains of up to 0.5 mm in size. Within each microdomain, the shape orientation of prismatic orthopyroxene and plagioclase is constant, defining a local foliation (Figure 15C, D), but their orientation differs widely between the microdomains.

The orthopyroxene grains in the symplectite are euhedral to subhedral. The grains are generally 5-30 microns in size, with occasionally grains of 0.1 mm long, and are generally prismatic. They have a variable Al_2O_3 content that can reach extreme values (up to 17.3 wt%). The spinel grains are also euhedral and are up to 10 times smaller than the orthopyroxene grains. The spinel grains are the smallest element of the symplectite but they are responsible for its green colour under the optical microscope (Figure 15C). The spinel grains are mostly concentrated at the orthopyroxene grain boundaries, forming small grains attached to larger prismatic orthopyroxene grains (Figure 15D). Some spinel grains have a special shape with bars and cross-bars resembling snowflakes, which may indicate fast precipitation from a liquid (Figure 15F) (Naslund 1984). The plagioclase fills up the rest of the space in between the orthopyroxene and the spinel grains and is generally anhedral. It does however, generally have an overall prismatic habitus with long axes parallel to the long axes of orthopyroxenes. Electron microprobe analyses of the symplectite are tabulated in the mineral chemistry section.

Biotite breakdown

Biotite is only present in a few samples whith a low abundance: in BG4 and BG2 from Bou Ibalghatene and in a number of samples from Tafraoute. Most samples only show a few biotite grains. In all garnet bearing samples biotite is breaking down. The biotite grains are found in the matrix (Figure 17E) or sometimes in between garnet grains breaking down to symplectites (Figure 18E, F). Biotite breakdown leads in most cases to growth of orthopyroxene, Titanomagnetite and possibly some liquid or vapour. Also plagioclase is present near the biotite and is locally observed in the reaction rim. Spinel is present in some samples in the reaction rim around biotite.

Pre-peak assemblage

The pre-peak mineral assemblage was present prior to the main mineral assemblage. It is now present as inclusions in garnet. The assemblage is:

- pl ± qtz ± TiMa ± sill ± rt ± zn-spl (Tafraoute,)
- pl ± qtz ± TiMa ± sill (Bou Ibalghatene, BG4)
- pl ± qtz ± TiMa (Bou Ibalghatene, BG2)

Inclusions

The garnet grains locally contain inclusions. These inclusions are signs of an older assemblage overgrown by the garnet close to peak metamorphism. Minerals found as inclusions are, sillimanite, quartz, titanomagnetite, plagioclase, rutile and zinc-spinel (Figure 16). Most sillimanites found as inslusions are elongated grains. Most of the other minerals found as inclusions are more rounded (Figure 18C). TiMa and zn-spl are found touching each other, together forming one rounded inclusion. Around and between the inclusions there is generally also a small symplectite.

Mineral chemistry

Garnet

Garnet microprobe analyses are included in the appendices. In total 83 analyses have been included. Figure 21 shows a ternary plot of Ca, Fe and Mg in garnet, corresponding to the fraction of grossular, almandine and pyrope. All garnet grains are solid solutions of almandine and pyrope with minor grossular (< 2.6 wt% CaO) and spessartine (< 1.6 wt% MnO). The garnet compositions are all fairly similar, but Figure 21 shows four clusters of garnet compositions, The clusters correspond to the average garnet compositions shown in Figure 22 of BG2, BG4, TA31 and the rest of the garnet bearing samples from Tafraoute. Figure 23 shows three graphs of linescan analyses across three garnet grains from samples TA12, TA16 and LKTA38. From the graph it can be seen that there is no significant difference in composition from core to rim. Only for the outermost rim of garnet from sample TA16 minor Fe-Mg exchange is recorded (X_{py} from 0.33 to 0.32 and X_{alm} from 0.61 to 0.62). This suggests complete homogenisation of garnet through diffusion. In Table 2 a number of representative point analyses on garnet are shown.

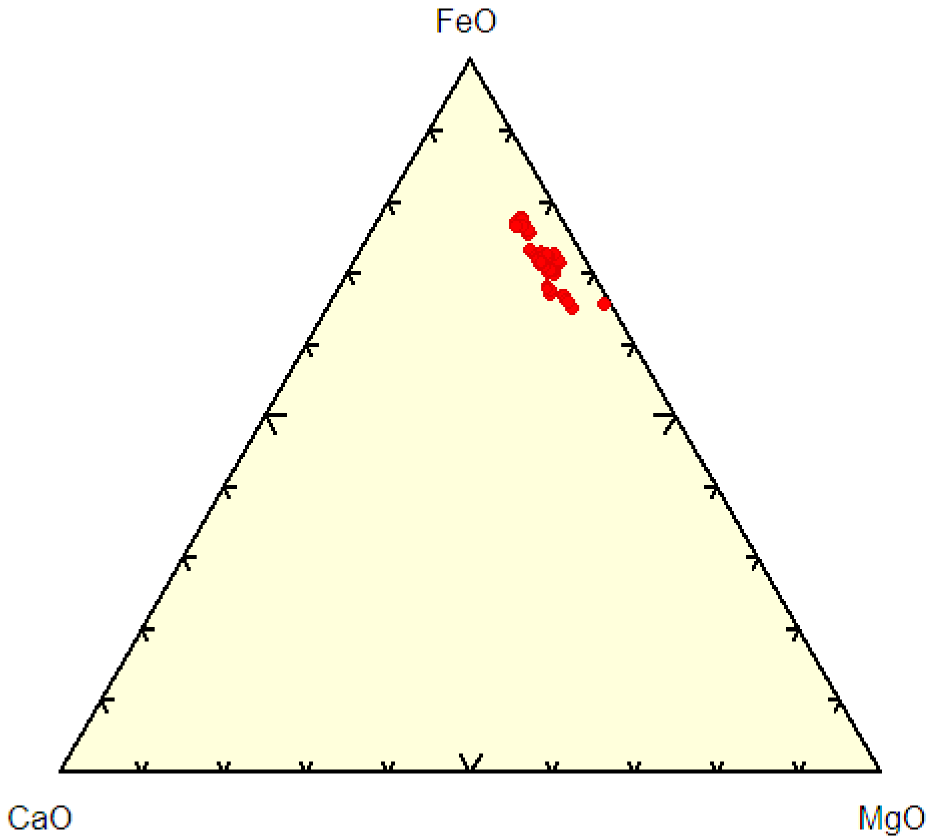


Figure 21 Ternary plot of garnet with Ca, Fe and Mg compositions corresponding to the grossular, almandine and pyrope fractions.

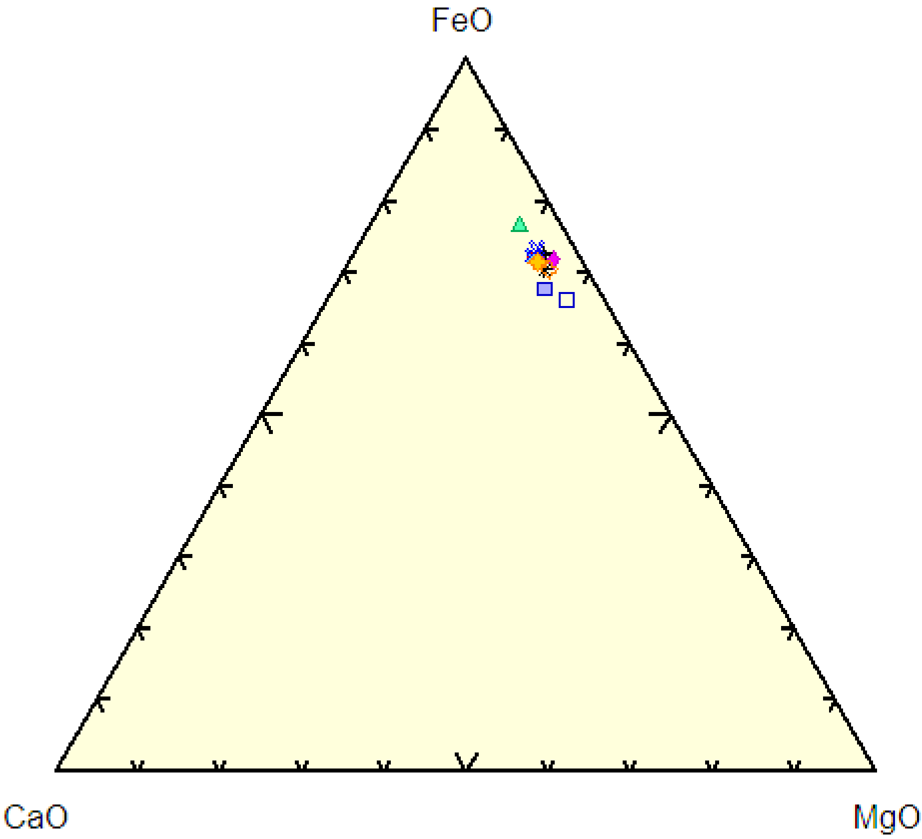


Figure 22 Ternary plot of garnet with Ca, Fe and Mg compositions corresponding to the grossular, almandine and pyrope fractions. The average composition of the different samples is used here.

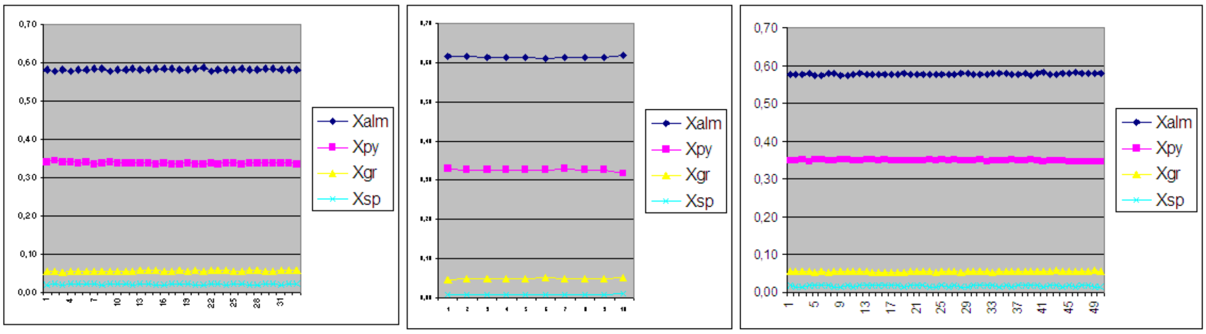


Figure 23 Plots of linescan analyses across garnet grains from (left) TA12, (middle) TA16 and (right) LKTA38. The fractions of almandine, pyrope, grossular and spessartine are plotted across a garnet grain.

Foto	BG2-025	TA31-002	BG4-009	TA18-006	TA11-002	LKTA14-002
Nr	10	32	3	2	2	3
SiO2	37.98	39.34	38.86	38.51	38.16	38.69
Al2O3	20.74	21.61	21.53	21.68	21.56	21.16

FeO	30.60	25.47	25.87	27.61	28.79	27.51
MnO	1.48	0.62	0.51	0.75	0.81	1.04
MgO	6.92	10.74	9.71	9.52	8.10	8.69
CaO	1.92	1.98	2.49	1.72	2.34	2.16
K2O	0.00	0.00	0.00	0.00	0.00	0.00
Na2O	0.01	0.01	0.00	0.00	0.01	0.02
TiO2	0.04	0.01	0.00	0.01	0.02	0.01
Cr2O3	0.00	0.01	0.00	0.01	0.01	0.02
NiO	0.00	0.00	0.00	0.05	0.01	0.04
ZnO	0.06	0.07	0.01	0.01	0.04	0.02
Cl	0.00	0.01	0.01	0.01	0.01	0.00
F	0.00	0.00	0.00	0.13	0.00	0.00
Total	99.74	99.86	98.99	100.00	99.86	99.36
Si	3.00	3.01	3.01	2.98	2.98	3.01
Al	1.93	1.95	1.97	1.98	1.98	1.94
Fe	2.02	1.63	1.67	1.79	1.88	1.79
Mn	0.10	0.04	0.03	0.05	0.05	0.07
Mg	0.81	1.22	1.12	1.10	0.94	1.01
Ca	0.16	0.16	0.21	0.14	0.20	0.18
K	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.00	0.00	0.00	0.00	0.00	0.00
Ti	0.00	0.00	0.00	0.00	0.00	0.00
Cr	0.00	0.00	0.00	0.00	0.00	0.00
Ni	0.00	0.00	0.00	0.00	0.00	0.00
Zn	0.00	0.00	0.00	0.00	0.00	0.00
Total	8.03	8.02	8.01	8.03	8.03	8.01
Xalm	0.65	0.53	0.55	0.58	0.61	0.59
Xpy	0.26	0.40	0.37	0.36	0.31	0.33
Xgr	0.05	0.05	0.07	0.05	0.06	0.06
Xsp	0.03	0.01	0.01	0.02	0.02	0.02

Table 2 Representative garnet analyses.

Feldspar

All feldspar analyses are included in the appendices. Figure 24 shows all 144 feldspar analyses in a ternary plot of albite, anorthite and orthoclase. The diagram shows considerable variation in the analysed compositions (n=3) of feldspar grains that occur as inclusions in other phases. Matrix feldspar plots either on the albite- orthoclase join or the albite- anorthite join. This corresponds largely to the partly unmixed feldspars shown in Figure 24. Plagioclases in the symplectites mostly plot on the albite- anorthite join and have a slightly higher anorthite composition than matrix plagioclase. There are two exceptional analyses that plot on the anorthite- orthoclase join. These are feldspars found in a symplectite around a biotite. The most logical interpretation is that they represent mixed analyses of very small Or and An grains.

A number of representative feldspar analyses are shown in Table 3. Plagioclases in symplectites seem to contain some iron. This may be due to the small grain size of the plagioclase found in the symplectites which are surrounded by spinel and orthopyroxene grains which do contain iron.

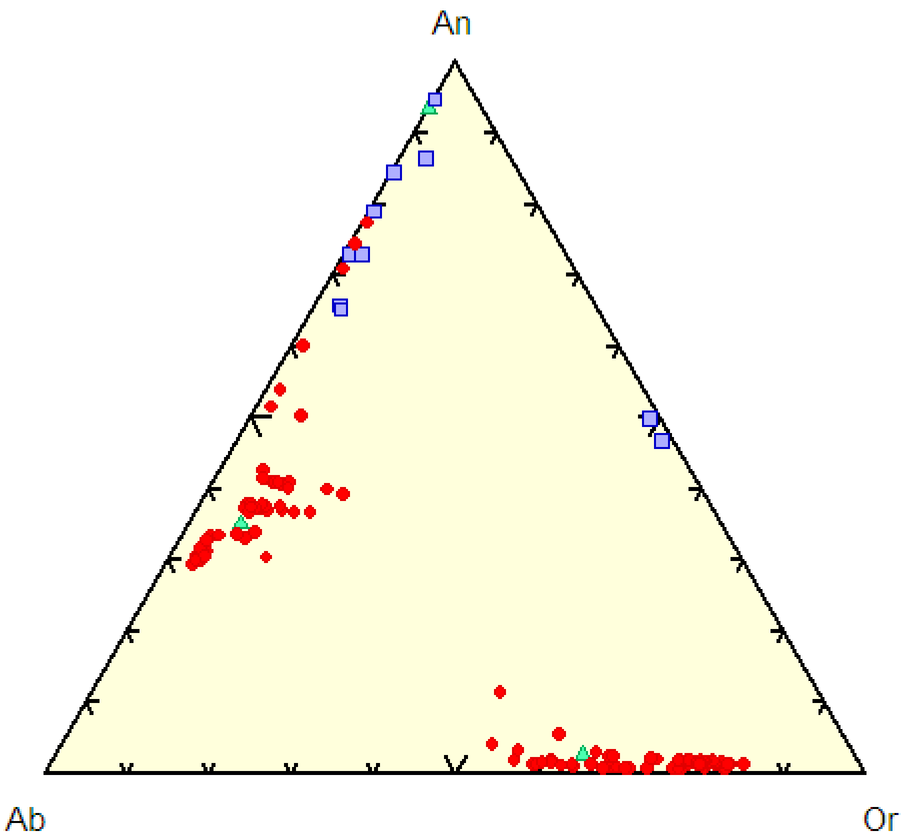


Figure 24Ternary plot of feldspars showing the fractions of albite, anorthite and orthoclase of the analysed spots. Red circles are feldspar from the matrix, blue squares are feldspar from the symplectites, green triangles are feldspar inclusions within garnet.

				LKTA38-		TA31-
Foto	BG4-006	TA11-012	BG2-028	003	TA12-002	003
Nr	3	3	8	30	36	46
SiO2	48.41	59.08	61.28	64.98	64.76	59.52

Al2O3	31.36	25.69	25.21	19.34	19.69	16.77
FeO	1.45	0.16	0.08	0.08	0.07	6.67
MnO	0.08	0.00	0.00	0.00	0.00	0.13
MgO	0.14	0.00	0.00	0.00	0.01	1.71
CaO	15.57	7.17	6.24	0.34	0.36	4.00
K2O	0.04	1.10	0.59	12.96	13.56	5.92
Na2O	1.58	6.61	7.54	2.25	1.96	0.10
TiO2	0.02	0.01	0.00	0.04	0.04	2.06
Cr2O3	0.00	0.00	0.00	0.00	0.00	0.00
NiO	0.00	0.00	0.00	0.00	0.01	0.00
ZnO	0.00	0.01	0.00	0.00	0.00	0.00
Cl	0.00	0.00	0.00	0.00	0.01	0.00
F	0.00	0.07	0.00	0.00	0.00	0.20
Total	98.65	99.91	100.93	99.99	100.46	97.06
Si	2.25	2.65	2.70	2.97	2.95	2.83
Al	1.72	1.36	1.31	1.04	1.06	0.94
Fe	0.06	0.01	0.00	0.00	0.00	0.27
Mn	0.00	0.00	0.00	0.00	0.00	0.01
Mg	0.01	0.00	0.00	0.00	0.00	0.12
Ca	0.78	0.34	0.29	0.02	0.02	0.20
K	0.00	0.06	0.03	0.76	0.79	0.36
Na	0.14	0.57	0.64	0.20	0.17	0.01
Ti	0.00	0.00	0.00	0.00	0.00	0.07
Cr	0.00	0.00	0.00	0.00	0.00	0.00
Ni	0.00	0.00	0.00	0.00	0.00	0.00
Zn	0.00	0.00	0.00	0.00	0.00	0.00
Total	4.96	4.99	4.98	4.99	5.00	4.81

Table 3 Representative feldspar analyses

Spinel

All spinel analyses done are included in the appendices. In Figure 25 all 113 spinel analyses have been plotted in a ternary diagram showing the Zn, Fe and Mg composition. This corresponds to the fractions of gahnite, hercynite and spinel. Spinel grains from the symplectite do not contain a significant amount of zinc and are relatively rich in hercynite. Spinel found in the matrix (only sample BG4) and as inclusions within garnet all contain zinc. It is probable that the latter two spinel types represent the same primary assemblage. A number of representative point analysis done on spinel are shown in Table 4. The table shows that spinel found as inclusions contains a lot of zinc up to 11.5 wt% ZnO.

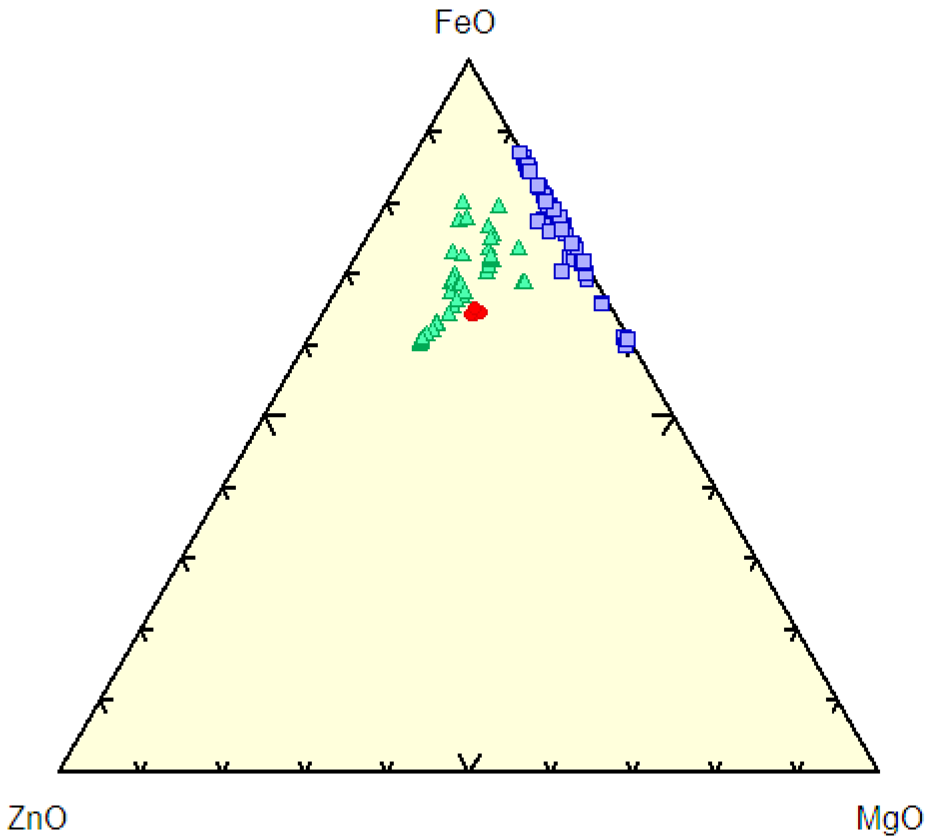


Figure 25 Ternary plot of spinel showing the Zn,Fe and Mg composition of the analysed spots. This corresponds to the fractions of gahnite, hercynite and spinel. Red circles are spinel from the matrix, blue squares are spinel from the symplectites, green triangles are spinel found as inclusion.

Foto	TA16-004	BG2-014	BG4-004	TA31-002	LKPTAF4-002	PTAF3-001
Nr	1	2	4	30	25	8
SiO2	2.66	0.09	0.00	1.11	0.00	0.00
Al2O3	53.57	58.96	53.31	57.97	42.41	52.59
FeO	33.97	32.49	27.30	29.06	41.28	26.62
MnO	0.22	0.69	0.04	0.31	0.00	0.11
MgO	6.99	7.72	7.71	9.98	5.37	6.19
CaO	0.02	0.00	0.00	0.04	0.00	0.00
K2O	0.00	0.00	0.00	0.00	0.00	0.00
Na2O	0.04	0.00	0.00	0.01	0.00	0.00
TiO2	0.02	0.06	0.05	0.05	0.52	0.06

Cr2O3	0.06	0.00	0.57	0.14	0.27	1.18
NiO	0.02	0.00	0.75	0.02	0.57	0.83
ZnO	0.21	0.13	7.47	0.08	6.70	11.52
Cl	0.01	0.00	0.00	0.00	0.00	0.01
F	0.00	0.00	0.03	0.00	0.00	0.20
Total	97.80	100.13	97.23	98.78	97.11	99.32
Si	0.08	0.00	0.00	0.03	0.00	0.00
Al	1.81	1.93	1.86	1.89	1.61	1.83
Fe	0.82	0.76	0.67	0.67	1.11	0.66
Mn	0.01	0.02	0.00	0.01	0.00	0.00
Mg	0.30	0.32	0.34	0.41	0.26	0.27
Ca	0.00	0.00	0.00	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.00	0.00	0.00	0.00	0.00	0.00
Ti	0.00	0.00	0.00	0.00	0.01	0.00
Cr	0.00	0.00	0.01	0.00	0.01	0.03
Ni	0.00	0.00	0.02	0.00	0.01	0.02
Zn	0.00	0.00	0.16	0.00	0.16	0.25
Total	3.02	3.03	3.06	3.02	3.18	3.07

Table 4 Representative spinel analyses

Orthopyroxene

All orthopyroxene analyses are included in the appendices.In Figure 26 all 108 orthopyroxene analyses are shown in a ternary plot of Al, Fe and Mg. It is clearly seen that the orthopyroxenes from the matrix plot in a small field with only a little aluminium. The orthopyroxenes from the symplectites are more scattered and have high to extreme aluminium contents. A number of representative analyses are shown in Table 5. Most remarkable is the observation that orthopyroxene from the symplectites contains up to 17 wt% Al_2O_3. Aluminium substitutes for 50 % with Mg + Fe, and the other 50 % for Si following the Tschermak exchange vector (Spear 1994).

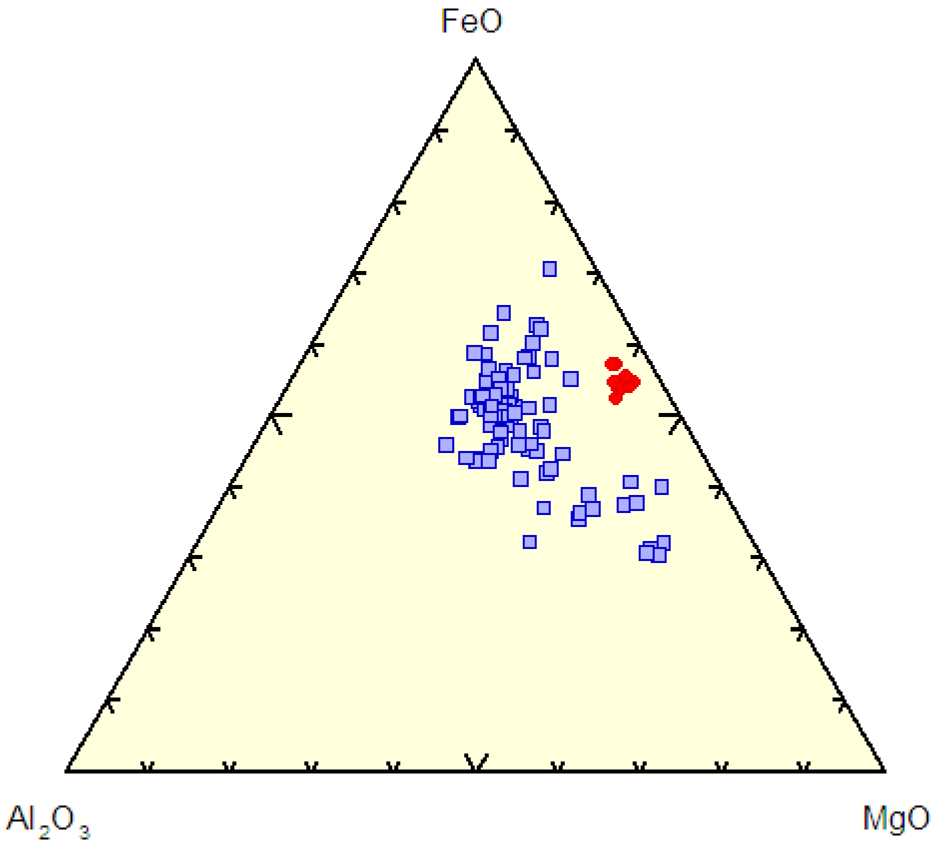


Figure 26Ternary plot of Al, Fe and Mg in orthopyroxene. Red circles are matrix orthopyroxene, blue squares are orthopyroxene from the symplectites.

Foto	TA16-003	BG2-025	BG2C-002	PTAF3-001	TA31-006	BG4-020
Nr	1	3	12	28	114	2
SiO2	45.28	50.97	51.55	40.92	47.32	46.53
Al2O3	7.42	2.32	2.02	17.25	7.85	8.49
FeO	30.03	26.45	26.33	26.00	26.50	22.12
MnO	0.46	0.35	0.32	1.20	0.81	0.39
MgO	13.99	19.43	19.82	13.23	17.06	18.92
CaO	0.46	0.12	0.21	0.19	0.37	1.40
K2O	0.00	0.00	0.00	0.00	0.00	0.00
Na2O	0.04	0.01	0.00	0.00	0.01	0.07
TiO2	0.15	0.05	0.03	0.01	0.01	0.54
Cr2O3	0.02	0.00	0.01	0.00	0.00	0.00
NiO	0.01	0.02	0.05	0.01	0.02	0.01
ZnO	0.06	0.17	0.27	0.14	0.00	0.02
Cl	0.01	0.02	0.00	0.00	0.00	0.00

F	0.00	0.00	0.00	0.00	0.13	0.00
Total	97.93	99.90	100.60	98.95	100.06	98.50
Si	1.80	1.94	1.95	1.58	1.81	1.77
Al	0.35	0.10	0.09	0.79	0.35	0.38
Fe	1.00	0.84	0.83	0.84	0.85	0.70
Mn	0.02	0.01	0.01	0.04	0.03	0.01
Mg	0.83	1.10	1.11	0.76	0.97	1.07
Ca	0.02	0.00	0.01	0.01	0.01	0.06
K	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.00	0.00	0.00	0.00	0.00	0.01
Ti	0.00	0.00	0.00	0.00	0.00	0.02
Cr	0.00	0.00	0.00	0.00	0.00	0.00
Ni	0.00	0.00	0.00	0.00	0.00	0.00
Zn	0.00	0.00	0.01	0.00	0.00	0.00
Total	4.02	4.01	4.01	4.02	4.02	4.02

Table 5 Representative orthopyroxene analyses

Symplectite

Two linescan analyses of 50 points across a symplectite rimming garnet are included in the appendices. From these linescan analyses, after removing the non-stoichoimetric analyses, an average is calculated, resembling a local bulk composition of the symplectite. Figure 27 shows a ternary plot of Ca, Fe and Mg in the symplectite together with the average composition of garnet grains (also shown in Figure 27). The diagram shows that the local bulk composition of the symplectite closely resembles the compositions of the remnant garnets. Table 6 shows the local bulk compositions of the symplectite. Compared with Table 2 there are some minor differences with representative garnet compositions:

- The symplectite bulk composition has a minor Na content
- The symplectite bulk composition has a minor K content
- The symplectite bulk composition has a slightly higher Al_2O_3 content.

In addition, an attempt has been done to calculate the original garnet composition on the basis of compositions and relative abundances of Spl, Opx and Pl. The best fit is obtained by the following linear combination:

3 Spl + 7.5 Opx + 3 An = 2.4 Py + 3.3 Alm + 1 Gro

0.4 Spl + 1.1 Opx + 0.4 An = 1 Grt (normalised to 1grt)

The fractions of Gro, Alm and Py are 0.15, 0.49 and 0.36 respectively. Compared with the garnet compositions the Gro content is too high.

The symplectite contains some minor Na and this icannot have been derived from the remnant garnets. The symplectite has also formed along cracks in the garnet, which may suggest the symplectite formation is triggered by fluid influx. Possibly the fluid influx triggered the symplectite formation and some minor Na was extracted from the fluid. More advanced reaction balancing gives the following result for symplectite formation:

4 Spl + 7.2 Opx + 2 Pl = 2.5 Py + 3.4 Alm + 0.3 Gro + 1Na (Liq)

1 Grt + 0.16 Na(Liq) = 0.6 Spl + 1.2 Opx + 0.3 Pl

This time the fractions of Gro, Alm and Py are 0.05, 0.55 and 0.39 respectively, which closely resembles the garnet compositions.

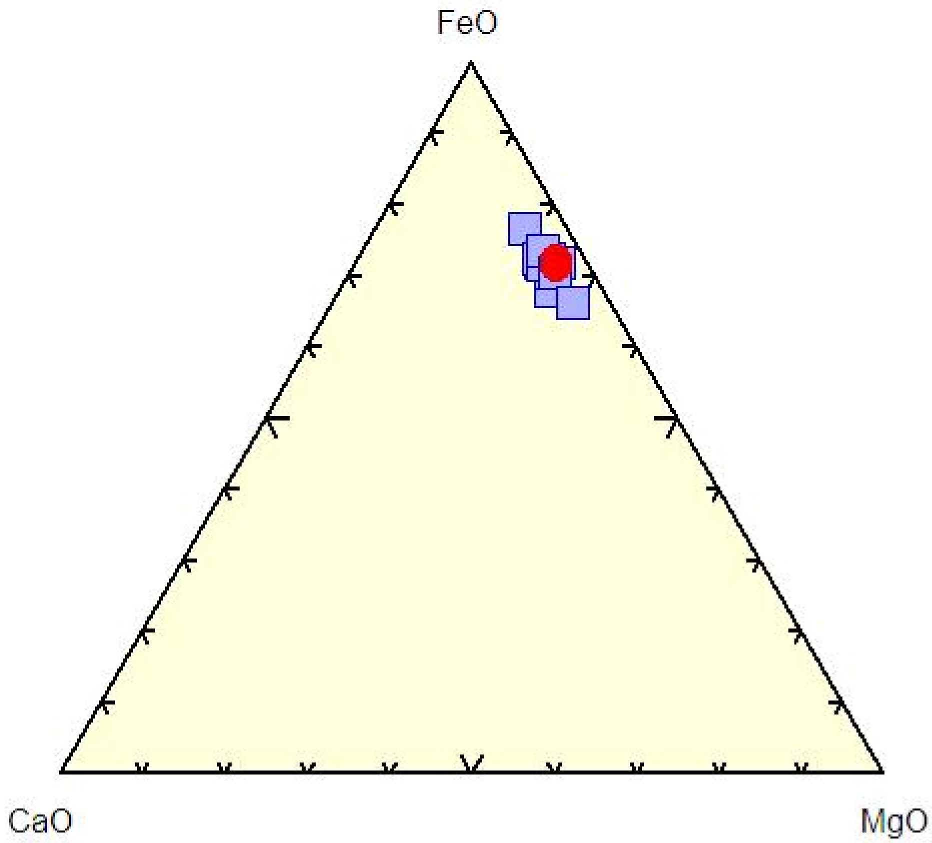


Figure 27 Ternary plot of garnet with Ca, Fe and Mg compositions corresponding to the grossular, almandine and pyrope fractions. Red circles are symplectite bulk compositions, Blue squares are the average composition of garnet grains of the different samples.

Foto Nr	L6	L3
SiO2	36.02	38.07
Al2O3	22.99	22.06

FeO	28.86	27.43
MnO	0.98	0.92
MgO	9.71	9.55
CaO	1.38	1.59
K2O	0.08	0.28
Na2O	0.10	0.14
TiO2	0.12	0.03
Cr2O3	0.02	0.02
NiO	0.02	0.01
ZnO	0.04	0.05
Cl	0.00	0.00
F	0.05	0.04
Total	100.37	100.19
Si	2.81	2.94
Al	2.11	2.01
Fe	1.88	1.77
Mn	0.06	0.06
Mg	1.13	1.10
Ca	0.12	0.13
K	0.01	0.03
Na	0.01	0.02
Ti	0.01	0.00
Cr	0.00	0.00
Ni	0.00	0.00
Zn	0.00	0.00
Total	8.14	8.07

Table 6 Average symplectite analyses, based on linescans of 50 point analyses.

Sillimanite

All sillimanite analyses are included in the apppendices. Fe is plotted against Al in Figure 28. All sillimanites have a small amount of FeO, 1-2 wt%. The sillimanite inclusions in garnet have a slightly larger range of FeO content than the matrix sillimanite.

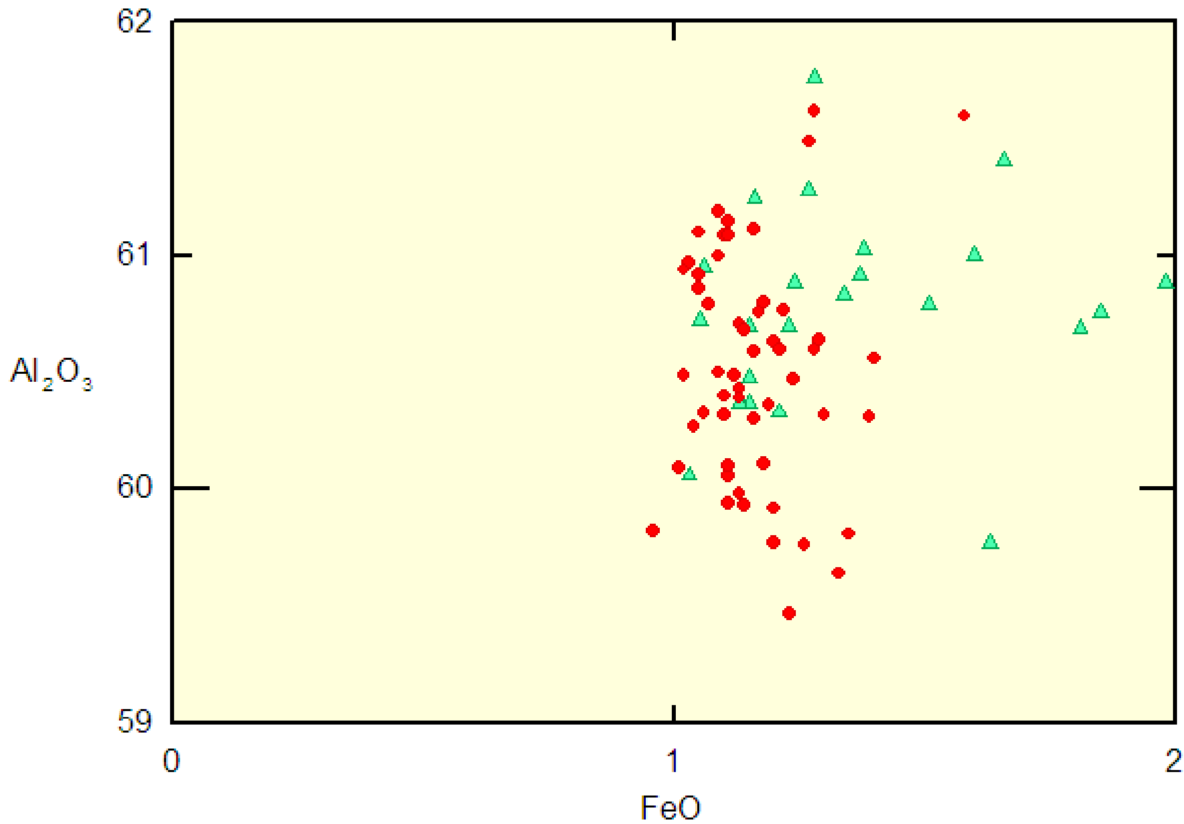


Figure 28 Al_2O_3 plotted against FeO of sillimanite. Red circles are matrix sillimanites, green triangles are inclusions in garnet.

Biotite

All biotite analyses are included in the appendices. A number of representative biotite analyisis are given in Table 7. Biotites are rich in TiO_2 (4.6-6.7 wt%) and contain a small amount of fluorine.

Foto	BG2-009	BG4B-002	BG2C-006	LKPTAF4-004	PTAF3-003	TA31-003
Nr	2	2	64	71	6	52
SiO2	35.12	34.86	35.96	34.81	34.61	35.61
Al2O3	14.17	17.52	14.73	17.25	16.62	16.95
FeO	17.42	14.83	18.26	17.84	17.43	13.63
MnO	0.00	0.00	0.00	0.02	0.04	0.03
MgO	11.89	12.17	11.73	9.90	10.46	12.47
CaO	0.03	0.02	0.00	0.00	0.01	0.01
K2O	9.36	9.32	9.56	9.36	9.48	9.60
Na2O	0.32	0.41	0.33	0.36	0.11	0.08
TiO2	5.16	4.97	5.32	5.19	5.48	5.78

Cr2O3	0.02	0.09	0.00	0.05	0.08	0.09
NiO	0.00	0.22	0.00	0.14	0.26	0.16
ZnO	0.10	0.10	0.11	0.19	0.04	0.00
Cl	0.01	0.03	0.01	0.00	0.07	0.01
F	0.70	0.12	0.62	0.00	0.53	0.26
Total	94.29	94.68	96.63	95.11	95.22	94.68
Si	2.73	2.64	2.72	2.65	2.65	2.68
Al	1.30	1.56	1.32	1.55	1.50	1.50
Fe	1.13	0.94	1.16	1.14	1.12	0.86
Mn	0.00	0.00	0.00	0.00	0.00	0.00
Mg	1.37	1.37	1.32	1.13	1.19	1.40
Ca	0.00	0.00	0.00	0.00	0.00	0.00
K	0.93	0.90	0.92	0.91	0.93	0.92
Na	0.05	0.06	0.05	0.05	0.02	0.01
Ti	0.30	0.28	0.30	0.30	0.32	0.33
Cr	0.00	0.01	0.00	0.00	0.00	0.01
Ni	0.00	0.01	0.00	0.01	0.02	0.01
Zn	0.01	0.01	0.01	0.01	0.00	0.00
Total	7.81	7.78	7.80	7.75	7.75	7.71

Table 7 Representative biotite analyses

Titanomagnetite

All titanomagnetite analyses are included in the appendices. Some of the titanomagnetite contain a significant amount of magnesium (geikielite component, $MgTiO_3$) and aluminium. There are also a few samples which contain some zinc, up to 2.4 wt% ZnO.

Rutile

All rutile analyses are included in the appendices. It is a relatively pure phase that only contains minor aluminium and iron.

Element mapping

On thin section TA-31 element X-ray mapping is done, using the SEM-EDS in Leiden. Figure 29 and Figure 30 show element maps of a symplectite which shows the distribution of the elements on the transition from garnet to the symplectite. The figures show a remarkable difference in the distribution of Fe and Mg. Mg seems to be reequilibrated while Fe is still in its original place, like in the garnet. Figure 31 shows the element maps of the biotite breakdown reaction. SEM photographs of the locations analysed with X-ray mapping are shown in Figure 32.

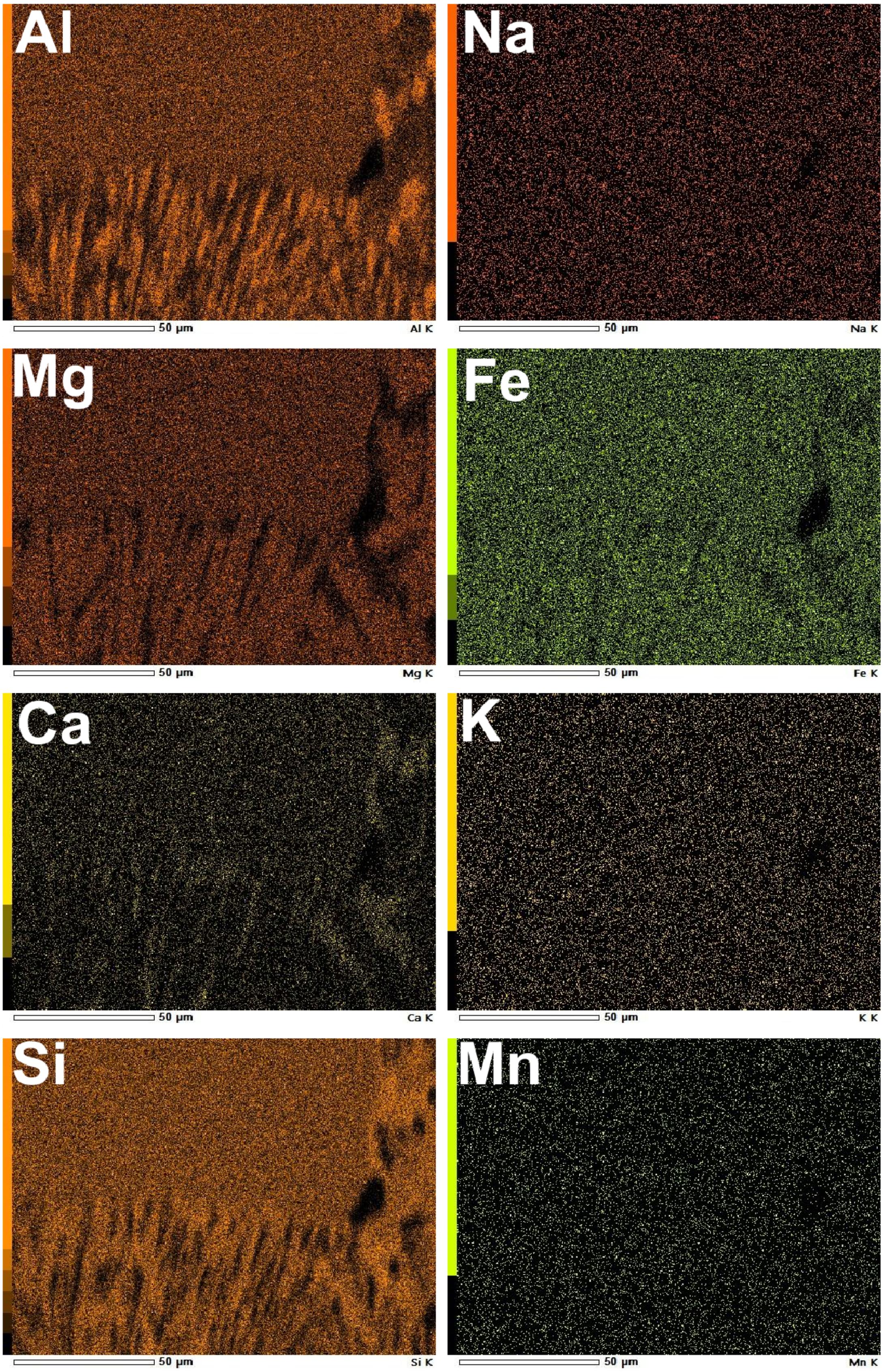


Figure 29 Element maps of the transition of garnet to symplectite of sample TA31. Note the remarkable difference in the distribution of Fe and Mg. Mg seems to be reequilibrated, Fe is mostly still in its original place of the garnet.

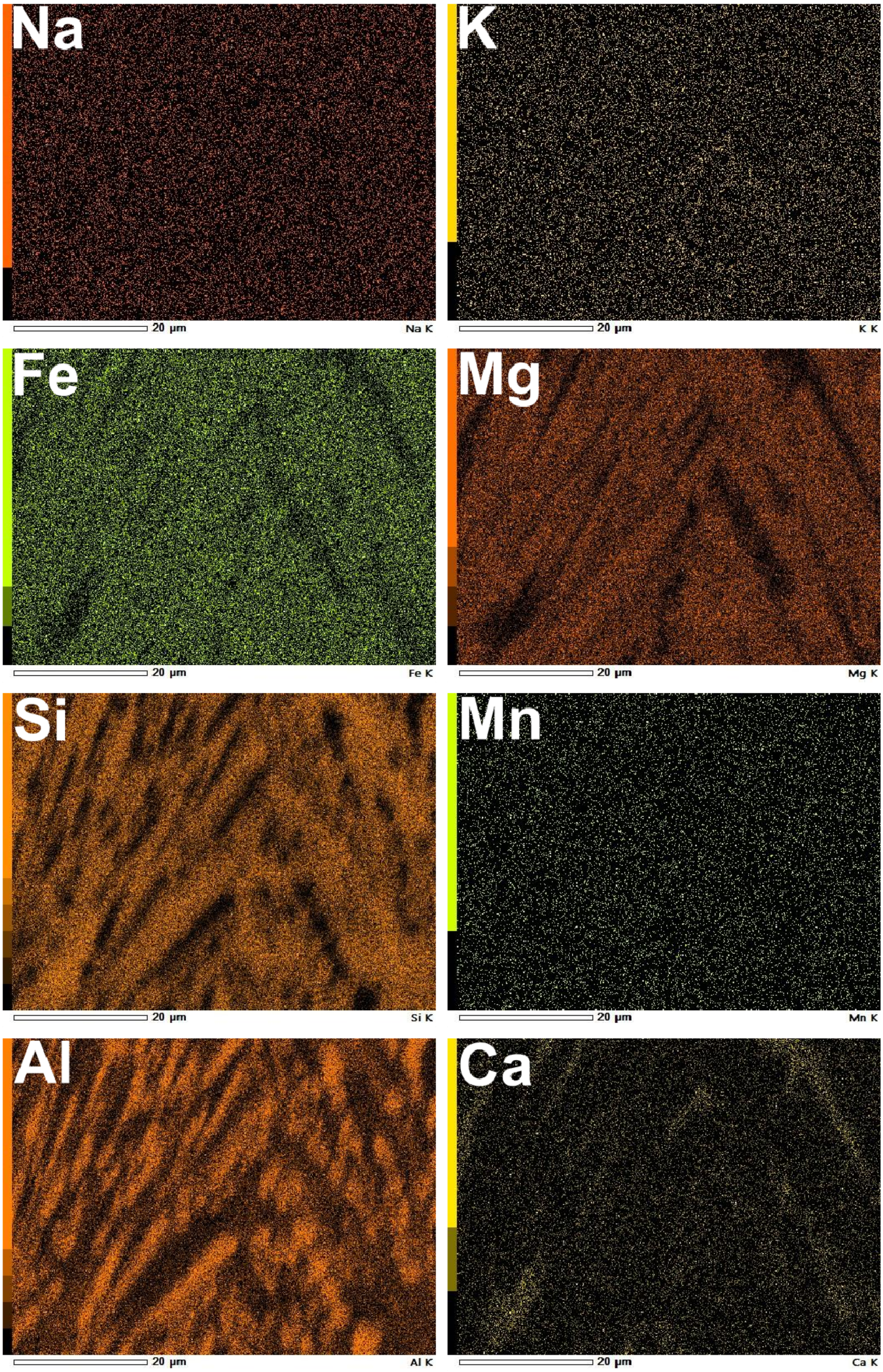


Figure 30 Element maps of a symplectite around garnet of sample TA31. Note the remarkable difference in the distribution of Fe and Mg. Mg seems to be reequilibrated, Fe is mostly still in its original place of the garnet.

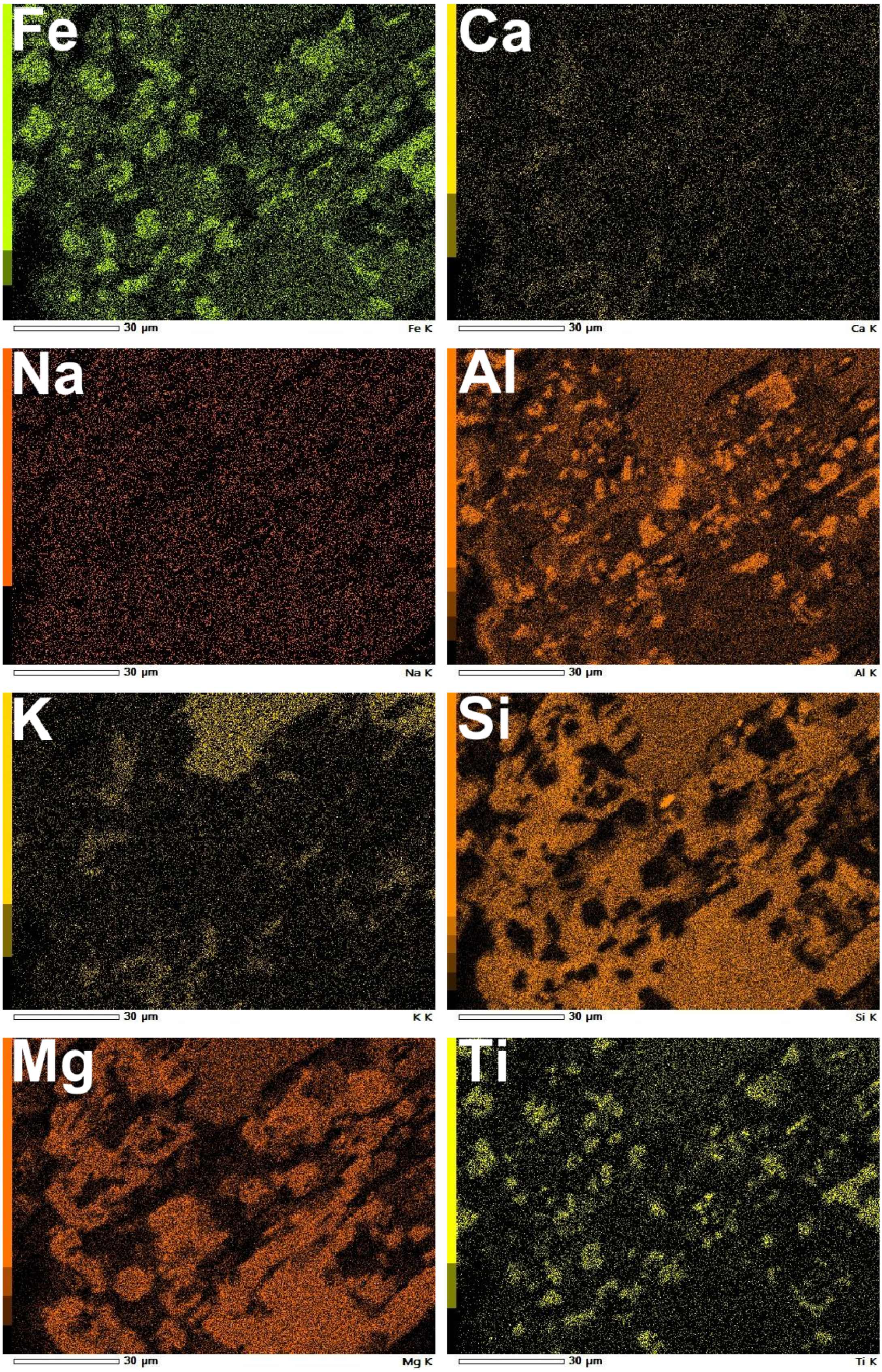


Figure 31 Element maps of biotite breakdown in sample TA31.

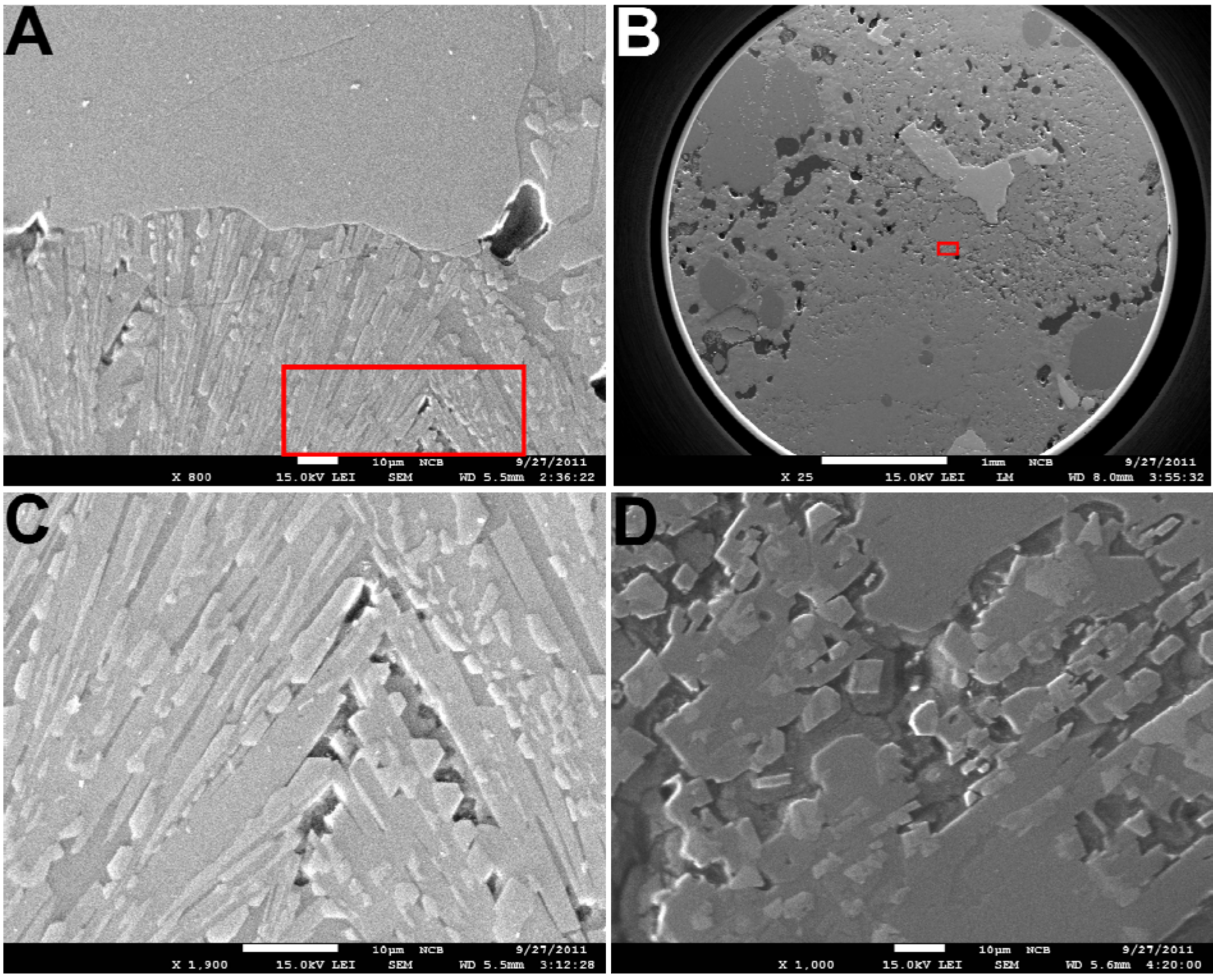


Figure 32 SEM images showing the locations of element mapping. A garnet- symplectite transition. Element maps are shown in Figure 29. Red square is the upper part of 4C. B part of sample TA31 showing location of element maps (red square shows the location of 4D) of biotite breakdown. C Symplectite around garnet. Element maps are shown in Figure 30. D Biotite breakdown, element maps are shown in Figure 31.

Raman spectroscopy

Raman spectroscopy has been used for a final identification of some very small minerals and inclusions. It was used to confirm that there is olivine present in sample BG4, and the spectrum is shown in Figure 33B. Also a small inclusion from sample LKPTAF-4 was identified with the Raman spectroscopy. Figure 33C shows the spectrum of the inclusion, that turns out to be a combination of feldspar and garnet, probably because the inclusion was so small that the feldspar was not measured alone but together with the garnet, giving a mixed signal. The orthopyroxenes from the symplectite were also analysed using raman spectroscopy. Figure 33A shows the spectrum of an orthopyroxene from the sympectite and an orthopyroxene measured earlier. The orthopyroxene from the symplectite is not recognised as an orthopyroxene by the software of the Raman spectroscopy probably because of its extremely high Al content. And in the figure a small shift of the peaks in the spectrum is seen. This suggests that the mineral structure of the orthopyroxene in the symplectite slightly changed, probably due to the extremely high Al content of the mineral and its fast crystallisation. This is an aspect of the current research that may need some further research, based on the question whetther estreme Al contents cause the opx structure to change onto a non-orthorohombic shape.

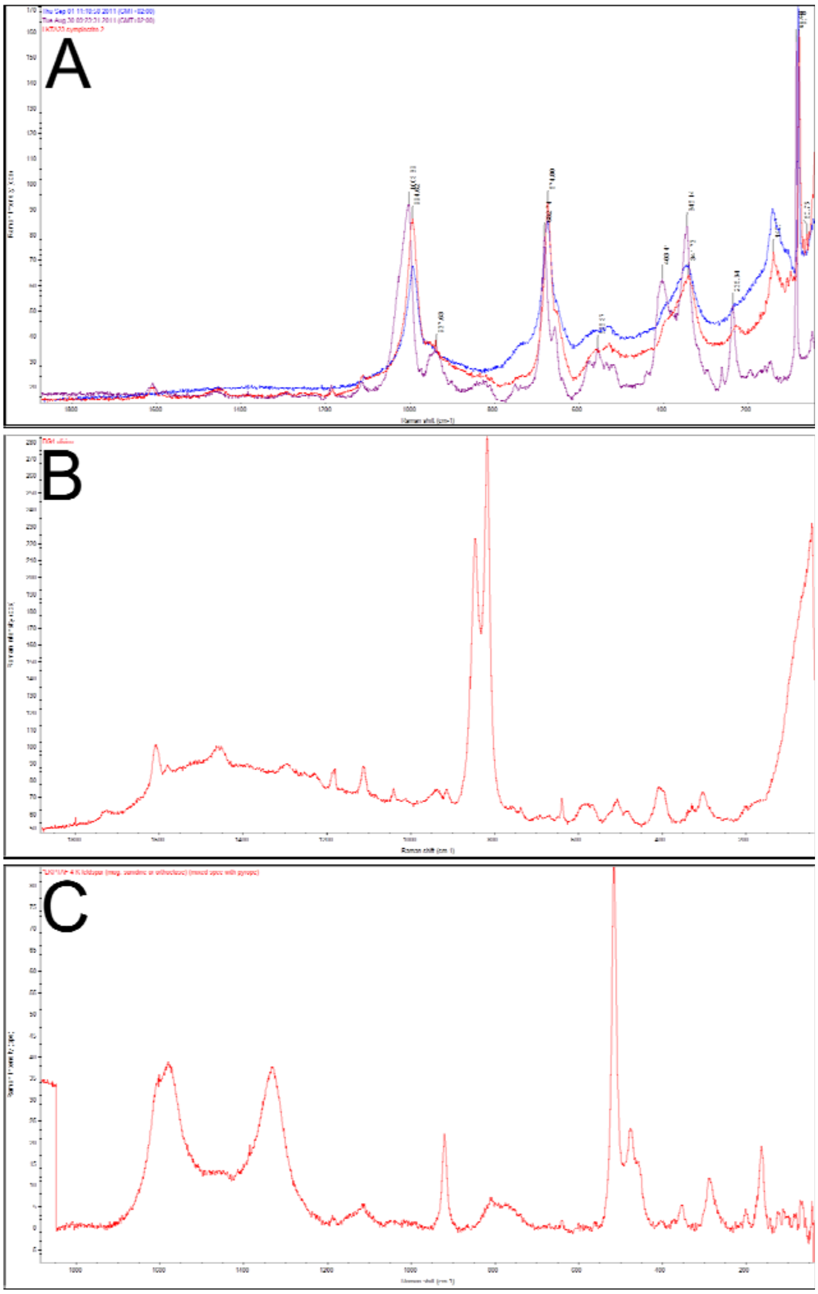


Figure 33 A Spectrum of three orthopyroxene, red and blue line from the symplectite, and purple line for a orthopyroxene measured earlier. B Spectrum of olivine from sample BG-4 C Spectrum of a feldspar inclusion mixed with the garnet.

Age dating

Some of the xenoliths also contain monazite as accesory mineral. With this mineral present it is sometimes possible to give an age for the sample. It was only possible to date monazites from sample BG2 from Bou Ibalghatene. The monazites from Tafraoute all contained calcium instead of thorium, and were thus impossible to date. The measurements were done on 3 monazite grains with a size of 100-200 microns. Analysed spots are shown in Figure 34. Table 8 shows the results of the analysed spots. In Figure 35 the calculated ages are shown of the analysed spots. There is a large scatter in the data but the age of the monazites is approximately 300 Ma, i.e. Hercynian.

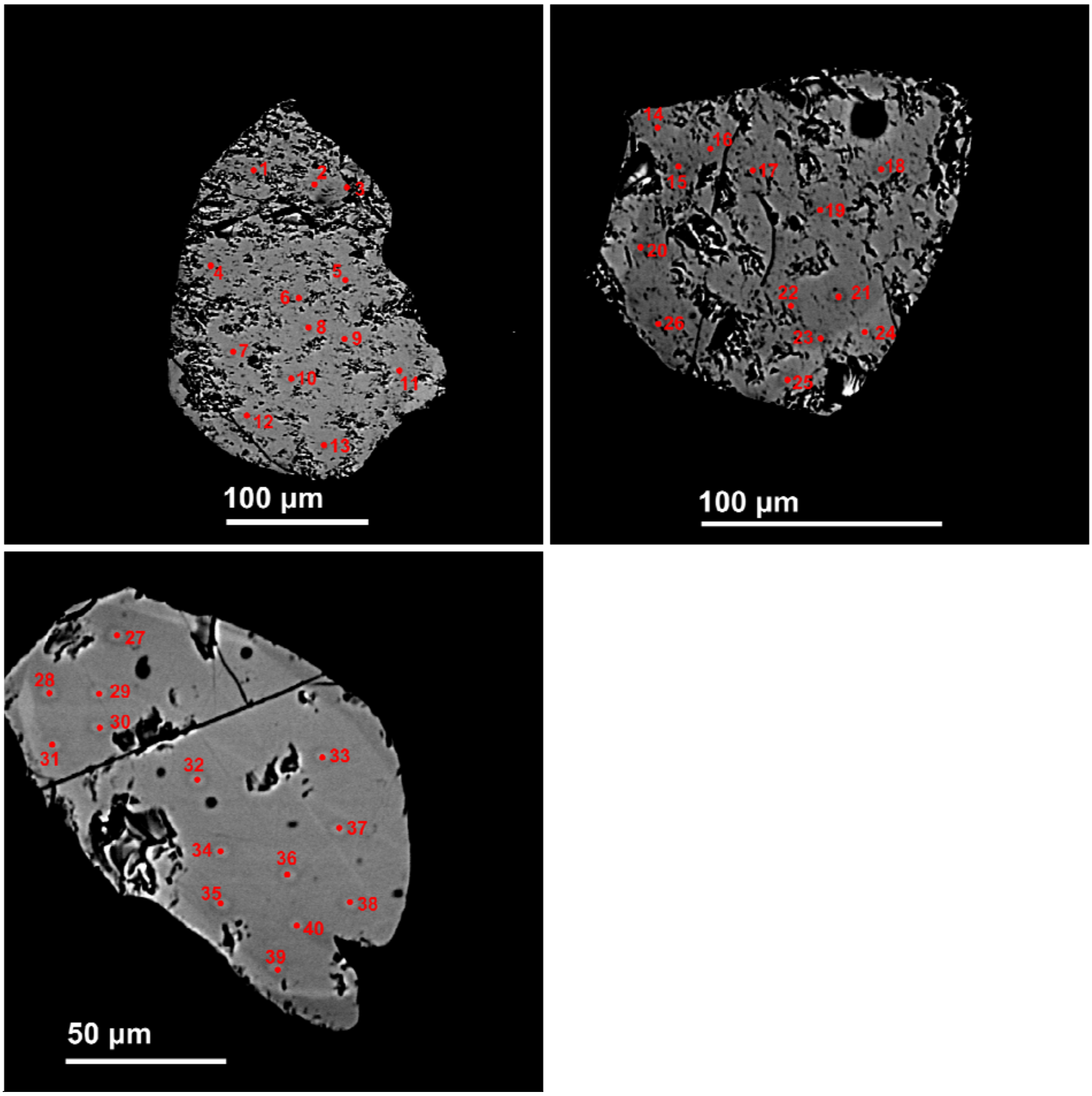


Figure 34 Monazites with the analysed spots from sample BG-2.

	concentration (mass%)

analysis nr.	PbO	ThO2	UO2
1	0.054385	4.32925	0.076509
2	0.03311	4.31543	0.074426
3	0.043016	4.26373	0.058882
4	0.062375	4.50679	0.053113
5	0.053622	4.67862	0.093766
6	0.052539	4.61536	0.062094
7	0.060143	4.60902	0.067303
8	0.061604	4.7933	0.086367
9	0.064698	4.80482	0.062975
10	0.050513	4.66409	0.061587
11	0.051402	4.78762	0.063452
12	0.054279	4.7521	0.064897
13	0.054149	4.77934	0.077033
14	0.073949	6.83941	0.068953
15	0.061693	4.38646	0.089504
16	0.061702	3.78308	0.096378
17	0.063708	4.48302	0.087311
18	0.064541	4.64639	0.086642
19	0.068898	4.54118	0.115617
20	0.076885	5.06611	0.073935
21	0.060133	4.55493	0.090361
22	0.062965	4.43383	0.092682
23	0.047107	4.6948	0.06517
24	0.095884	7.53287	0.113769
25	0.093716	7.27938	0.073515
26	0.069609	4.76554	0.101287
27	0.084949	4.88164	0.311298
28	0.071073	4.69978	0.147493
29	0.059987	4.8588	0.222613
30	0.062221	4.78922	0.246726
31	0.075309	4.96453	0.155123
32	0.077558	4.86347	0.273931
33	0.067808	5.06992	0.254903
34	0.067517	4.73502	0.230701

35	0.072672	4.89919	0.24516
36	0.076102	4.80574	0.263146
37	0.072803	4.8722	0.2492
38	0.068328	4.82116	0.277686
39	0.072256	5.23772	0.264799
40	0.074017	4.82216	0.265927

Table 8 Results of the analysed spots of the monazites shown in Figure 34.

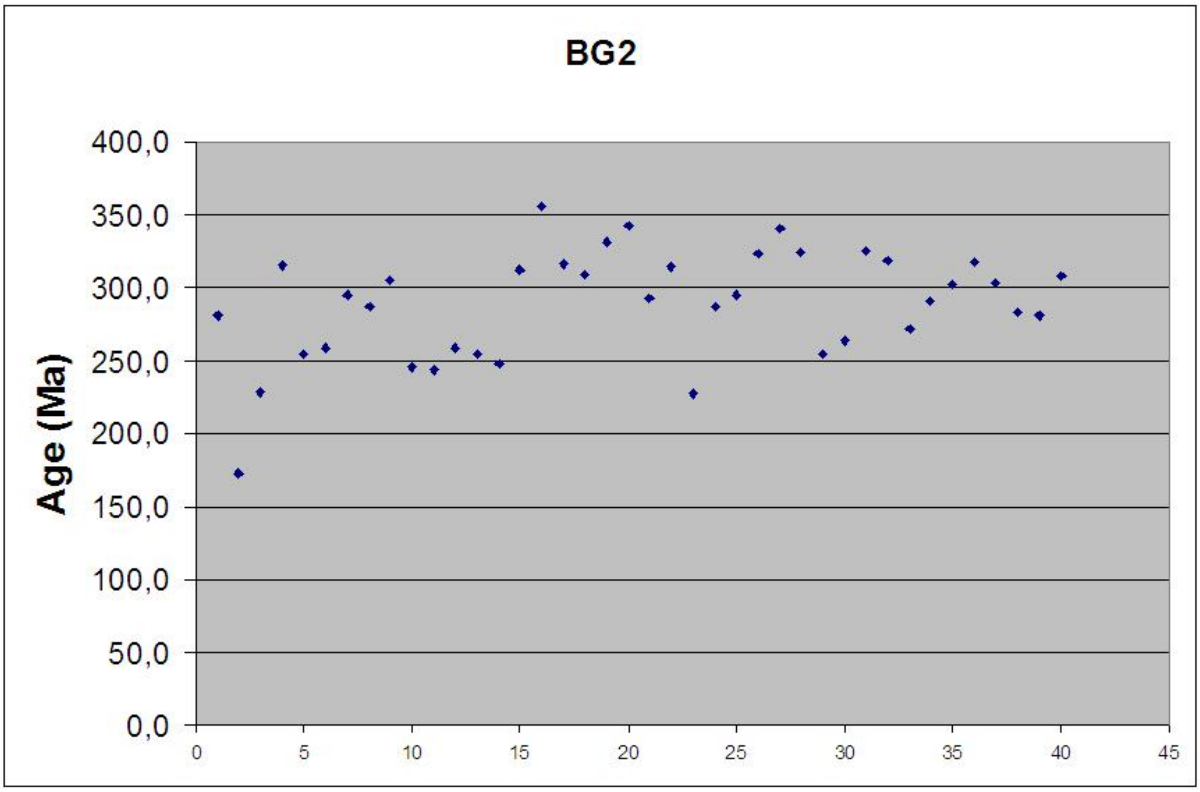


Figure 35 Graph showing the calculated ages for the analysed spots.

Thermobarometry

Orthopyroxene- garnet thermobarometry

Pressures and temperatures from orthopyroxene garnet mineral assemblages have been estimated using the thermometer and barometer from Harley (Harley 1984A, B). The thermometer is based on Fe-Mg partitioning between orthopyroxene and garnet. The exchange reaction describing the distribution of Fe-Mg between orthopyroxene and garnet is:

$\frac{1}{3}Mg_3Al_2Si_3O_{12}$	+	$\frac{1}{2}Fe_2Si_2O_6$	=	$\frac{1}{3}Fe_3Al_2Si_3O_{12}$	+	$\frac{1}{2}Mg_2Si_2O_6$
pyrope	+	ferrosilite	=	almandine	+	enstatite

The barometer is based on the solubility of Al in orthopyroxene coexisting with garnet. The reaction describing the Al_2O_3 content of orthopyroxene in equilibrium with garnet is:

$Mg_2Si_2O_6$	+	$MgAl_2SiO_6$	=	$Mg_3Al_2Si_3O_{12}$
Orthopyroxene solution			=	garnet

The formulas used to calculate pressure and temperature are shown in Figure 36.

There are two mineral assemblages which contain both orthopyroxene and garnet. This is in the main mineral assemblage of BG2 which consists of opx + pl + grt + qtz (+bt?), and in the reaction assemblage of symplectite formation which consists of gt + spl + pl + opx.

The orthopyroxene in the symplectite is a product of garnet breakdown. Other product phases are spinel and plagioclase. Table 9 shows the garnet and orthopyroxene compositions used for the calculations. Figure 37 shows calculated pressures and temperatures for this reaction assemblage. There is a large scatter in the calculated pressures and temperatures, ranging from 1-16 kb and 950-1350 °C. There are several reasons why the pressure and temperature conditions of the symplectite formation are hard to identify with orthopyroxene-garnet thermobarometry.

The breakdown of garnet forming the symplectite is probably a very fast process (this is explained further in the discussion) and the reaction may not be in equilibrium,whereas the formulas used to calculate pressure and temperature assume equilibrium. Hence, the Fe-Mg distribution in orthopyroxene and garnet may be different than expected in an equilibrium reaction. The speed of the reaction can also have influenced the solubility of Al_2O_3 in orthopyroxene. Figure (*Figure 26*) shows that the orthopyroxene compositions for the orthopyroxene from the symplectites have a large scatter. The Fe, Mg and Al are not distributed evenly over all orthopyroxenes, and the path lengths for reequilibration seem to be very limited.

The second problem stems from the microprobe analyses on the orthopyroxene grains. The grains are so small that it is possible that in some cases not only the orthopyroxene was measured but also the surrounding spinel or plagioclase.

$$T(^\circ C) = \left\{ \frac{3{,}740 + 1{,}400 X_{gr}^{ga} + 22.86\, P\,(\mathrm{kb})}{R \ln K_D + 1.96} \right\} - 273$$

with

$$K_D = \left\{ \frac{\mathrm{Fe}}{\mathrm{Mg}} \right\}^{ga} \Big/ \left\{ \frac{\mathrm{Fe}}{\mathrm{Mg}} \right\}^{opx}$$

and

$$X_{gr}^{ga} = (\mathrm{Ca}/\mathrm{Ca} + \mathrm{Mg} + \mathrm{Fe})^{ga}.$$

$$P\,(\mathrm{kb}) = \frac{1}{206.74} \left\{ \begin{array}{l} RT \ln K_2 + T[0.15 + 0.001507(T - 970)] - 2467 \\ - [2458(1000/T) - 1261](2(X_{Fe}^{opx})^2) \\ - [3525(1000/T) - 1667][1 - 2X_{Mg}^{opx}(1 - X_{Al}^{M1}](1 - X_{Mg}^{opx})(1 - X_{Al}^{M1}) \\ - [4.75T - 6680][2(1 - X_{Mg}^{opx})(1 - X_{Al}^{M1})] \\ + 920[(1 - 2X_{Al}^{M1})(1 - X_{Al}^{M1})(1 - X_{Mg}^{opx})] \\ + [5436 - 2.45T][(1 - X_{Mg}^{opx})[X_{Mg}^{opx}(1 - X_{Al}^{M1}) + X_{Al}^{M1}]] \\ + 5700[X_{gr}^{ga}(X_{gr}^{ga} + X_{alm}^{ga})] \end{array} \right\}$$

where

$K_2 = (X_{py}^{ga})^3/(X_{Mg}^{opx})^3 X_{Al}^{M1}(1 - X_{Al}^{M1})$

X_{Mg}^{opx} = Mg/(Mg + Fe) in orthopyroxene,

X_{gr}^{ga} = Ca/(Ca + Mg + Fe) in garnet,

X_{py}^{ga} = Mg/(Ca + Mg + Fe) in garnet,

X_{Al}^{M1} = Al/2 in 6-oxygen unit orthopyroxene.

X_{Fe}^{opx} = Fe(/Mg + Fe) in orthopyroxene,

X_{alm}^{ga} = Fe/(Ca + Mg + Fe) in garnet.

Figure 36 Formulas used to calculate temperature and pressure from Harley. (Harley 1984A, B)

Sample photo and analysis point	Gt			Opx		
	Fe	Mg	Ca	Fe	Mg	Al
BG4-023 (1) & 024 (1)	1.69	1.14	0.21	0.88	0.96	0.24
BG4-010 (1&2)	1.64	1.14	0.21	0.97	0.89	0.36
BG4-014 (1&3)	1.99	1.14	0.20	0.93	0.87	0.48
TA-16-007 (1&2)	1.85	1.00	0.16	1.00	0.74	0.51
BG2-013(1) & 014 (4)	1.95	0.84	0.17	1.00	0.79	0.30
TA11-002 (2) & 003 (1)	1.88	0.94	0.20	0.89	0.80	0.58

Table 9 Garnet and orthopyroxene compositions (molar, based on 12 oxygens for Gt and 6 for Opx) used for thermobarometry. Pictures and analyses can be found in the appendix.

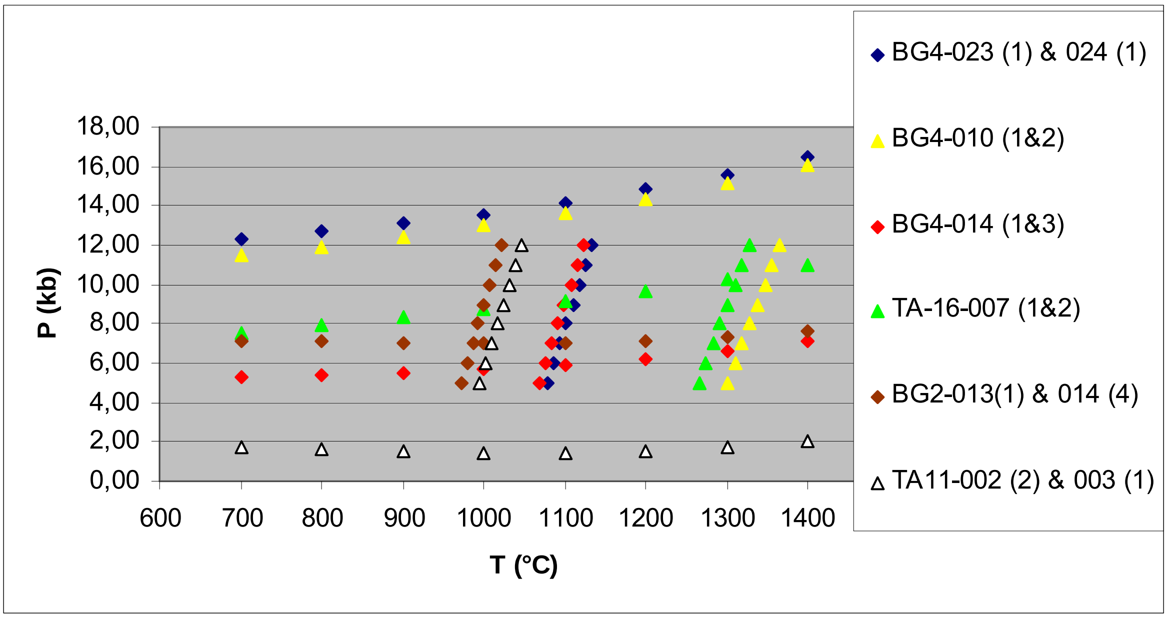


Figure 37 Graph showing the calculated pressures and temperatures for the different samples. Pictures and analyses can be found in the appendix. Lines with steep slopes are Gt-Opx Fe-Mg exchange thermometers, the flatter ones are Gt-Opx Al-based barometers.

Sample photo and analysis point	Gt			Opx		
	Fe	Mg	Ca	Fe	Mg	Al
BG2-025 (4&5)	2.02	0.80	0.19	0.83	1.11	0.12
BG2-025 (8&7)	2.01	0.81	0.20	0.83	1.12	0.09

Table 10 Garnet and orthopyroxene compositions (molar, based on 12 oxygens for Gt and 6 for Opx) used for thermobarometry. Pictures and analyses can be found in the appendix.

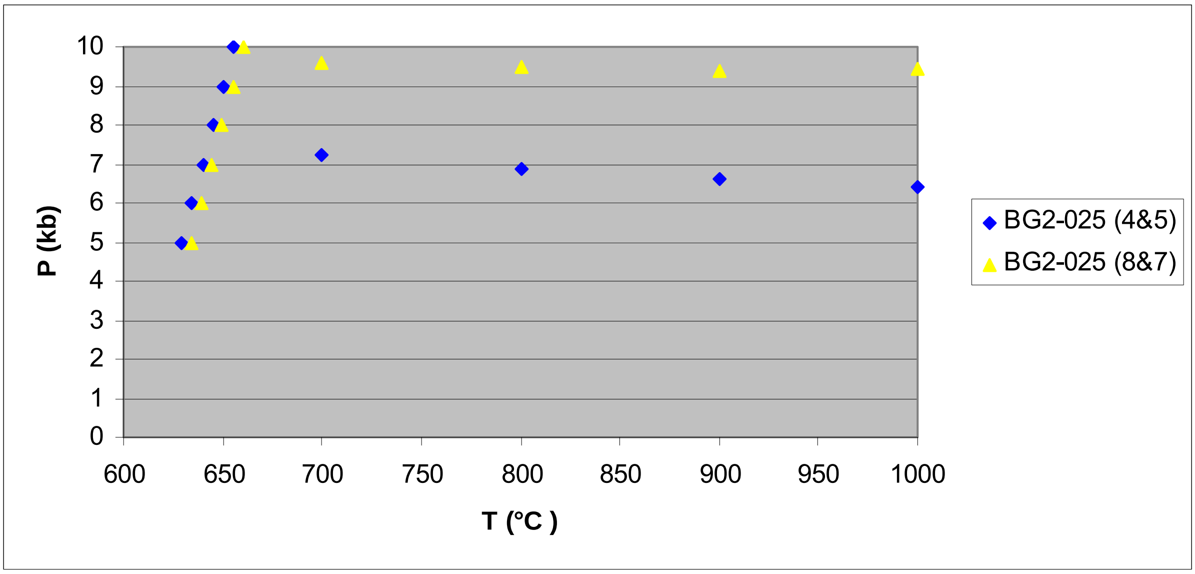


Figure 38 Graph showing the calculated pressures and temperatures for the different samples. Pictures and analyses can be found in the appendix. Lines with steep slopes are Gt-Opx Fe-Mg exchange thermometers, the flatter ones are Gt-Opx Al-based barometers.

The orthopyroxene-garnet pairs from the main mineral assemblage of sample BG2 give better results. The orthopyroxenes in this sample are larger and have grown together with garnet. The orthopyroxene and garnet used for the calculations are in contact, or there is a symplectite rim in between the two minerals, and thus the minerals were originally in contact. Table 10 shows the garnet and orthopyroxene compositions used for the calculations. Figure 38 shows the calculated pressures and temperatures for the orthopyroxene-garnet pairs. The temperatures are the same for the different pairs, around 650 degrees, and the pressures range from 6.5 to 9.5 kb.

TWQ

TWQ (Thermobarometry with estimation of equilibrium state) is a program to calculate mineral equilibria. Figure 39 shows diagrams for orthopyroxene-garnet pairs of some samples. For the diagrams microprobe data of garnet and orthopyroxene in close contact have been used. It calculates the reaction line of enstatite + almandine = ferrosilite + pyrope, being essentially the same as the Fe-Mg exchange thermometer used above. The temperatures found with TWQ are similar to the ones found with Harley. For the sample TA16 the temperatures calculated with TWQ are slightly higher. The diagrams also show that the orthopyroxenes from the symplectite give a large temperature variation in equilibrium with garnet, from 900 to 1400 degrees. This is because the garnet breakdown reaction forming the symplectite is probably not an equilibrium reaction (see discussion elsewhere).

The temperature found for the garnet-orthopyroxene pair from sample BG2 is also similar to the one found with Harley's calibration.

A diagram for the garnet breakdown reaction is shown in Figure 40. For the diagram microprobe data of garnet, plagioclase, spinel and orthopyroxne from a symplectite enclosing a garnet grain have been used. In the diagram there is no single P-T point where all reaction lines converge that could represent the PT conditions of garnet breakdown, but instead all reaction lines intersect at variable, high temperatures, from 900 to 1400 degrees.

For the main mineral assemblage from BG4, pl + grt + zn-spl + crn + TiMa, a diagram is shown in Figure 40. For the diagram microprobe data of garnet, plagioclase, corundum and spinel from the main mineral assemblage of sample BG4 have been used. The diagram shows three reaction lines which all intersect in one point. This PT point of 1000 degrees and 10 kb is interpreted as the PT conditions where the main mineral assemblage of sample BG4 was in equilibrium.

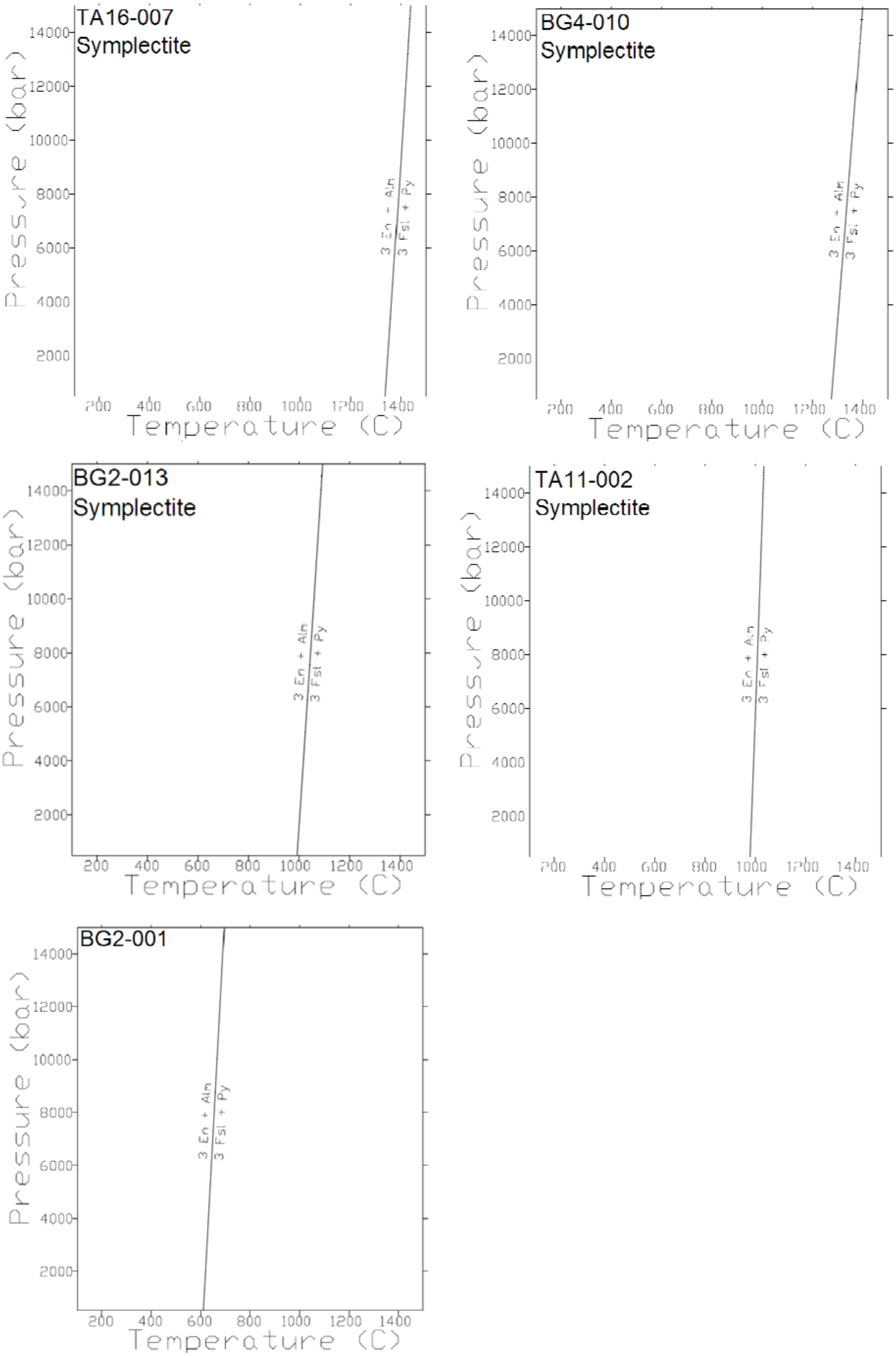


Figure 39 PT diagrams calculated with TWQ for orthopyroxene-garnet pairs.

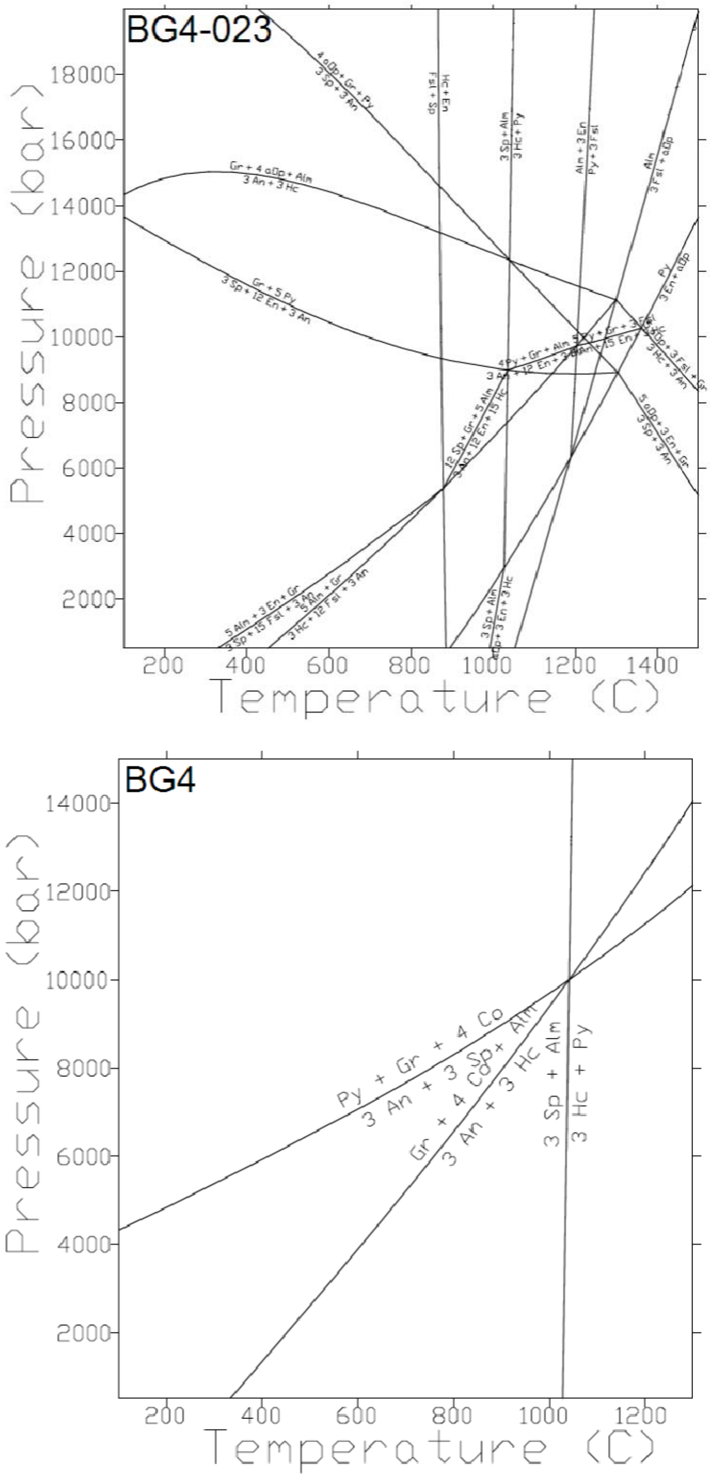


Figure 40 PT diagrams made with TWQ for garnet breakdown (BG4-023, up) and for the peak T assemblage of sample BG4 (down).

Two-feldspar thermometry

In some samples large plagioclase grains show exsolved patches of alkalifeldspar and large alkalifeldspar grains show exsolved patches of plagioclase. The compositions of exsolved patches and their host can be used for two-feldspar thermometry using the SolvCalc program (Wen and Nekvasil 1994). In the program I chose the thermodynamic formulation of Fuhrman and Lindsley (1988). The results are shown in Table 12. Figure 41 show the feldspars used for the two-feldspar thermometry and the spots analysed on the microprobe. SolvCalc calculates three temperatures for the given plagioclase and orthoclase compositions, T_{ab}, T_{or} and T_{an}, and then gives the average of the three temperatures. The tables show that the temperatures given for T_{ab}, T_{or} and T_{an} can differ widely. The sum of differences of the temperatures calculated is also given in the tables. For the most reliable temperature the sum of differences should be less than 80 degrees (Fuhrman and Lindsley, 1988). If it exceeds 80 degrees and one temperature differs by more than 100 degrees while the other two are similar, the average of the two similar temperatures is used (Fuhrman and Lindsley, 1988). There is one analysis where all three temperatures differ significantly and this one has been neglected.

In sample LKTA38 a plagioclase with exsolved patches of orthoclase is in contact with an orthoclase with exsolved patches of plagioclase (Figure 41). The original composition of the plagioclase and orthoclase prior to the formation of the exsolved patches were calculated where the plagioclase:patch and alkalifeldspar:patch ratio is taken as 9:1 on the basis of volume estimates under microscopic view. Table 11 shows the calculation and the new compositions found. These compositions can be used for two-feldspar thermometry of the plagioclase and alkalifeldspar prior to exsolution.

The temperatures calculated all show a cooling path, from 850 to 720 °C for sample TA12, from 916 prior to exsolution to 780 °C for sample LKTA38 and from 900 to 600 °C for sample BG2. In conclusion the cooling path of feldspars of sample BG2 confirms the cooling path of garnet-orthopyroxene thermobarometry, but P cannot be constrained by this technique.

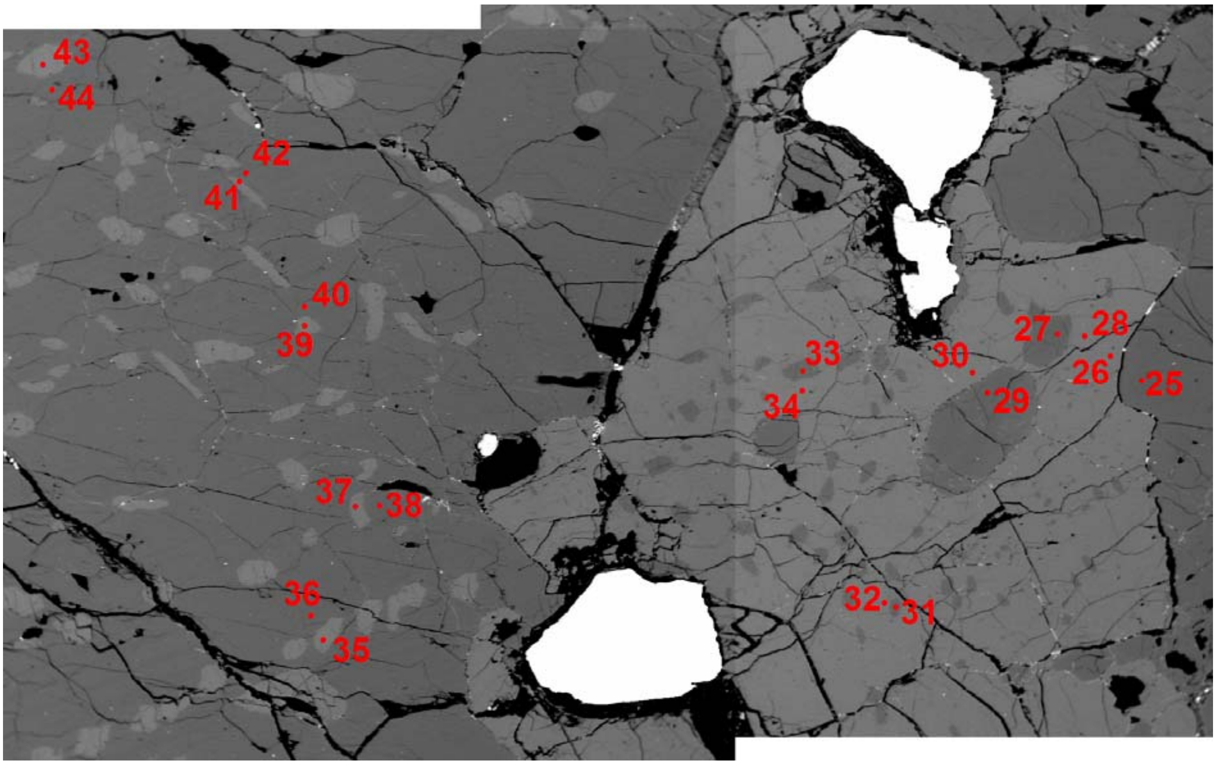


Figure 41 Microprobe photographs of sample LKTA38. Right plagioclase with orthoclase exsolution patches. Left orthoclase with plagioclase exsolution patches. Red spots and numbers correspond to the analysis number used in the calculations for the two-feldspar thermometry, and to the analyses in the appendix.

	Xab	Xor	Xan
pl	0.497	0.094	0.409
ortho	0.204	0.777	0.019
	0.100	0.100	0.100
	0.900	0.900	0.900
or corr	0.233	0.709	0.058
ortho	0.294	0.683	0.023
pl	0.515	0.077	0.408
	0.100	0.100	0.100
	0.900	0.900	0.900
pl corr	0.493	0.137	0.370

Table 11 Calculated composition of orthoclase and plagioclase, plagioclase:patch and alkalifeldspar:patch ratio is taken as 9:1 on the basis of volume estimates under microscopic view.

Photo	analysis nr.		Tab	Tor	Tan	T (°C)		sum of differences		T (°C)
TA12	21-22	T00	820.36	864.51	820.36	835.1		88.3		820.36
	23-24	T01	761.22	764.95	761.22	762.5		7.46		762.5
	25-26	T02	792.53	822	792.53	802.4		58.94		802.4
	27-28	T03	794.92	794.92	794.92	794.9		0		794.9
	29-30	T04	850.47	901.48	850.47	867.5		102.02		850.47
	31-32	T05	764.74	766.15	764.74	765.2		2.82		765.2
	33-34	T06	751.97	761.96	751.97	755.3		19.98		755.3
	35-36	T07	740.02	740.02	740.02	740.0		0		740.0
	37-38	T08	745.35	745.35	745.35	745.4		0		745.4
	39-40	T09	737.17	737.17	737.17	737.2		0		737.2
	41-42	T10	719.32	729.27	719.32	722.6		19.9		722.6
	43-44	T11	789.3	851.34	789.3	810.0		124.08		789.3
	45-46	T12	726.94	728.43	726.94	727.4		2.98		727.4
	47-48	T13	731.33	731.33	731.33	731.3		0		731.3
	49-50	T14	729.96	729.96	729.96	730.0		0		730.0

Photo	analysis nr.		Tab	Tor	Tan	T (°C)		sum of differences		T (°C)
LKTA38	25-26	T00	815.31	815.31	815.31	815.3		0		815.3
	27-28	T01	791.34	791.34	791.34	791.3		0		791.3
	29-30	T02	797.25	797.25	797.25	797.3		0		797.3
	31-32	T03	855.49	945.52	842.23	881.1		206.58		848.86
	33-34	T04	859.37	930.72	855.98	882.0		149.48		857.675
	35-36	T05	876.6	819.22	819.22	838.3		114.76		819.22
	37-38	T06	992.92	807.22	764.64	854.9		456.56		785.93
	39-40	T07	966.87	784.21	775.75	842.3		382.24		779.98
	41-42	T08	1022.26	838.42	774.17	878.3		496.18		806.295
	43-44	T09	887.68	815.63	815.63	839.6		144.1		815.63
estimated original composition										
		T10	912.88	924.86	912.88	916.9		23.96		916.9

Photo	analysis nr.		Tab	Tor	Tan	T (°C)		sum of differences		T (°C)

BG2C	25-27	T00	855	738.69	738.69	777.5		232.62		738.69
	26-27	T01	884.02	734.95	734.95	784.6		298.14		734.95
	28-29	T02	854.16	740.74	743.39	779.4		226.84		742.065
	30-31	T03	847.07	729.39	729.39	768.6		235.36		729.39
	34-35	T04	930.36	717.63	717.63	788.5		425.46		717.63
	35-36	T05	934.01	679.36	679.36	764.2		509.3		679.36
	36-38	T06	956.68	658.68	658.68	758.0		596		658.68
	39-40	T07	955.97	657.33	657.33	756.9		597.28		657.33
	41-42	T08	925.04	673.52	673.52	757.4		503.04		673.52
	47-48	T09	920.21	686.85	686.85	764.6		466.72		686.85
	49-50	T10	896.77	735.1	896.77	842.9		323.34		896.77
	51-52	T11	932.37	778.17	675.56	795.4		513.62		
	53-54	T12	830.05	735.41	830.05	798.5		189.28		830.05
	56-57	T13	783	727.63	783	764.5		110.74		783
BG2-028	1-2	T14	644.38	644.38	644.38	644.4		0		644.4
	2-3	T15	710.07	710.07	710.07	710.1		0		710.1
	4-5	T16	738.95	717.37	738.95	731.8		43.16		731.8
	4-6	T17	728.73	715.81	728.73	724.4		25.84		724.4
	7-8	T18	731.06	716.54	731.06	726.2		29.04		726.2
	9-10	T19	880.16	730.61	743.43	784.7		299.1		737.02
BG2-029	1-2	T20	984.24	610.46	603.33	732.7		761.82		606.895
	3-4	T21	977.04	625.97	625.97	743.0		702.14		625.97
	5-6	T22	944.8	711.1	747.88	801.3		467.4		729.49
BG2-030	1-2	T23	942.79	637.24	637.24	739.1		611.1		637.24

Table 12 Results of the calculations done with SolvCalc. Program output can be found in the appendix.

Perplex

The Perplex software was used for thermodynamic modelling. With local bulk compositions pseudosections can be calculated to learn more about the stability limits of observed mineral assemblages.

Prograde path- peak mineral assemblage

For the prograde path and peak metamorphism some pseudosections were calculated. The bulk composition for the prograde path is unknown, especially if a significant amount of melt has been extracted, but a composition can be estimated from observations done with optical microscopy and microprobe analyses. The inclusions in garnet are thought to represent the mineral assemblage present before peak metamorphism, and can give us information on the prograde path.

Table 13 shows the bulk composition used as input for the pseudosections in Figure 42, Figure 43, Figure 46 and Figure 48. Figure 44 show the stability fields of minerals on pseudosection incl18. The inclusion mineral assemblage is sill ± qtz ± TiMa ± pl ± rt ± zn-spl. The mineral stability fields on the pseusosection show several important PT constraints on the prograde path. Sillimanite is only present under the ky → sill reaction line from 6 kb and 600 degrees to 12 kb and 900 degrees. This gives the maximum pressure for the prograde path. The minimum pressure for the prograde path is given by the fact that cordierite is absent. This is above 3 kb at 600 degrees. Quartz is present only at lower temperatures but also in the pressure window given by sillimanite and the absence of cordierite.

Also a first impression of the peak metamorphic conditions is shown in the pseudosection. The peak mineral assemblages are pl + grt + zn-spl + crn + TiMa for Bou Ibalghatene and sill + grt + pl + TiMa + rt ± bt for Tafraoute. Figure 44 shows the stability of garnet, which is one of the main phases in the peak metamorphic assemblage, overgrowing the prograde mineral assemblage (inclusions in garnet). The stability field of garnet is in line with the stability field of the prograde metamorphism, and is present as a major phase from 900 degrees. At the high temperatures the melt fraction is increasing in the pseudosection (Figure 44), changing the composition of the rock when it is extracted, which becomes now more restitic. The pseudosection however gives a good impression of the peak metamorphic conditions. Only the stability of spinel is very sensitive for a different composition (Figure 45), probably the high zinc content of the spinel found in the main mineral assemblage and spinel inclusions stabilizes the spinel.

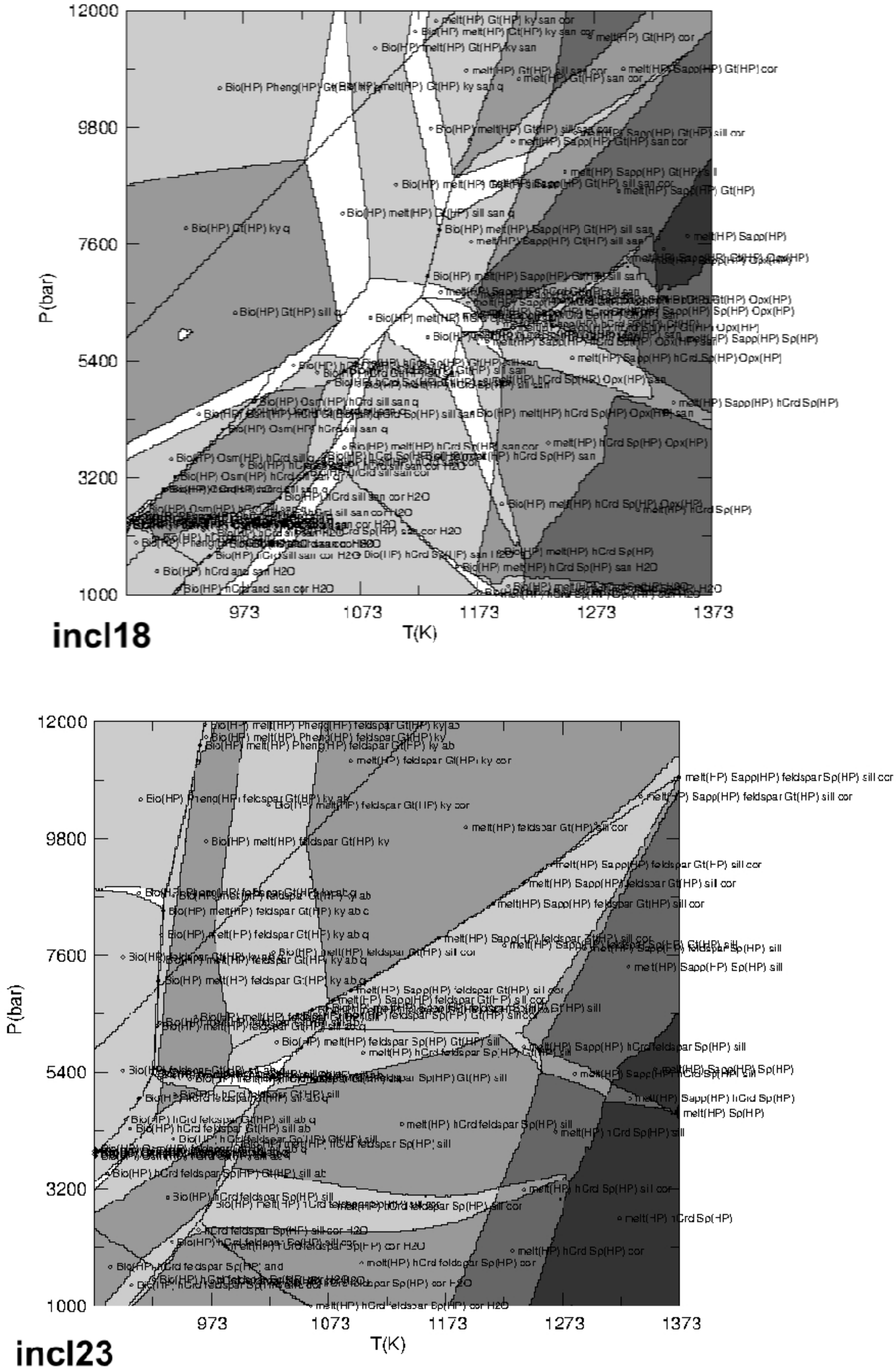
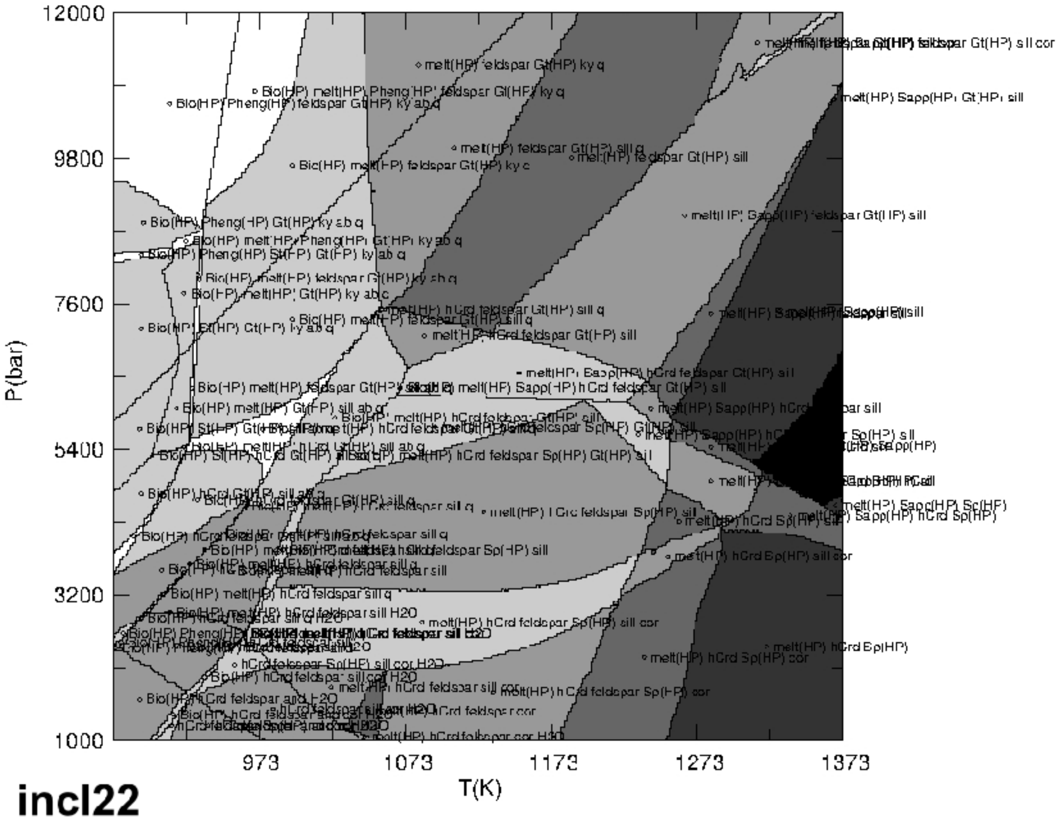
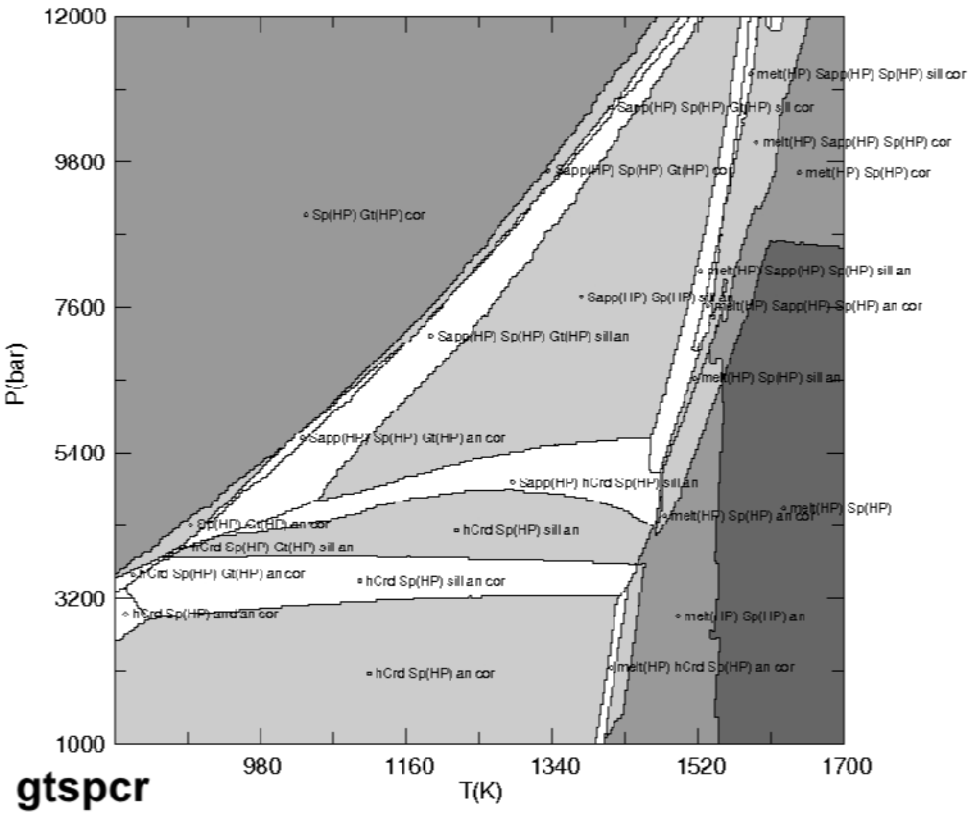


Figure 42 Pseudosections calculated with Perplex based on a estimated bulk composition from inclusions. Table 13 shows the bulk compositions used for the pseudosections.



incl22



gtspcr

Figure 43 Pseudosections calculated with Perplex. Pseudosection incl22 is based on a estimated bulk composition from inclusions. Pseudosection gtspcr is based on a composition of spinel garnet and corundum only. Table 13 shows the bulk compositions used for the pseudosection.

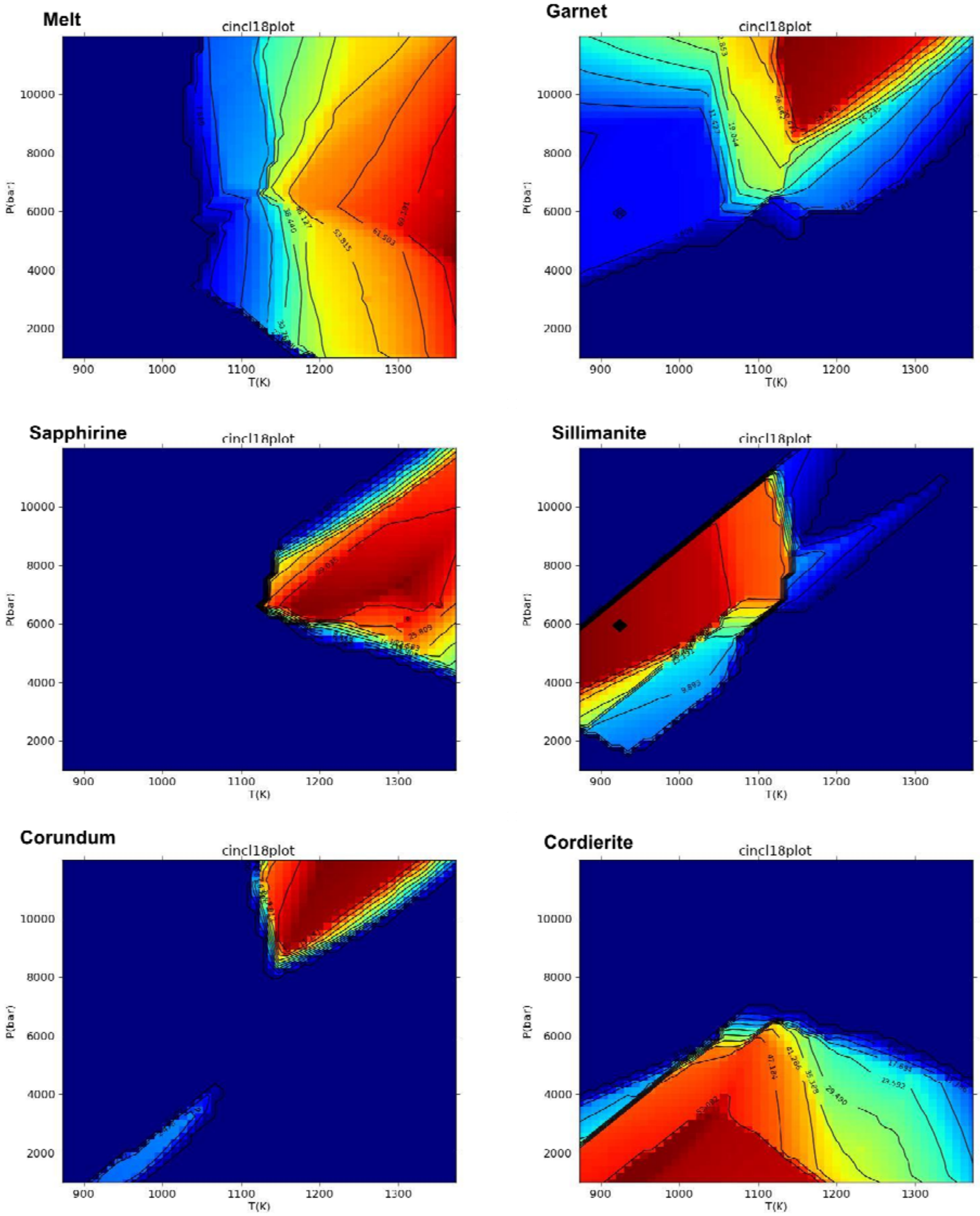


Figure 44 Stability fields of melt, garnet, sapphirine, sillimanite, corundum and cordierite in pseudosection incl18.

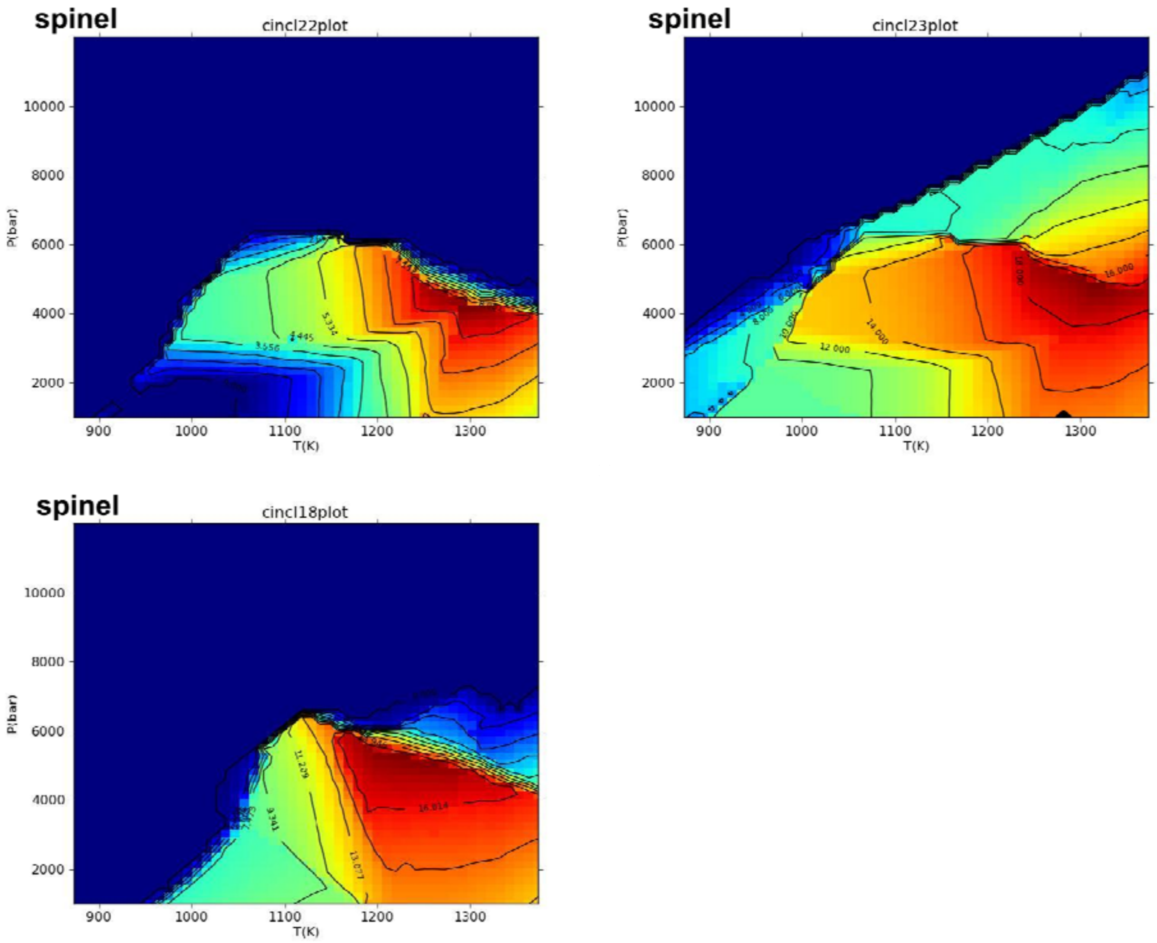


Figure 45 Stability fields of spinel for the three different pseudosections shown in Figure 42 and Figure 43.

	incl18	incl23	incl22	gtspcr	bg2	gt21	TA12-L6	
NA2O		0.030	0.035		0.015			molar amount
K2O	0.035	0.015	0.017		0.027			molar amount
AL2O3	0.207	0.258	0.224	1.704	0.110	0.211	0.194	molar amount
FEO	0.103	0.094	0.052	0.757	0.194	0.387	0.357	molar amount
SIO2	0.483	0.515	0.586	0.643	0.508	0.646	0.604	molar amount
MGO	0.103	0.058	0.052	0.436	0.122	0.221	0.216	molar amount
H2O	0.069	0.030	0.035		0.024			molar amount
CAO				0.044		0.037	0.031	molar amount

Table 13 Compositions used for the calculations of the pseudosections.

The peak metamorphism for Bou Ibalghatene is characterised by the presence of corundum, spinel and garnet together. Garnet and corundum are both stable at temperatures above 900 degrees at a minimum pressure of 6 kb at 900 degrees to 10 kb at 1100 degrees. The

maximum temperature and minimum pressure for coexisting garnet, corundum and spinel is shown in the pseudosection of Figure 43, where a composition is used based on garnet, corundum and spinel only. Here spinel is stable together with corundum and garnet, and a reaction line to the non-observed sapphirine gives the maximum temperature and minimum pressure for the rock. For a pressure of 10 kb the maximum temperature is approximatly 1100 degrees. The peak metamorphism for Bou Ibalghatene was at high temperature and pressure from 8-10 kb and 900-1100 degrees.
The peak metamorphic assemblage of Tafraoute is characterised by sillimanite, feldspar and garnet, with minor corundum. Probably the peak metamorphism was at a lower temperature than in Bou Ibalghatene and just entered the corundum stability field, ot the bulk assemblage was less aluminous.

For modeling the prograde path and peak metamorphism of sample BG2 from Bou Ibalghatene the composition shown in Table 13 was used. This composition is based on an estimation of the original bulk composition of the rock: 3opx + 5grt + 2bt + 5fsp + 1q. Figure 46 shows the speudosection of sample BG2, and Figure 47 show the stability fields of its constituent minerals. The absence of cordierite in sample BG 2 gives a minimum pressure of 3-5 kb. Also the absence of spinel in the prograde and peak metamorpic assemblages (it is present only in the symplectites) gives a minimum pressure and temperature shown in Figure 47. The absence of spinel and the presence of garnet corresponds below 8 kb, and at higher pressures garnet can be present at high temperatures, >950 degrees, but because spinel is not present in the sample and at temperatures above 950 degrees spinel is stable at 10 kb, these temperatures are unlikely. Quartz is only present at lower temperatures, and is precerved in the sample as inclusions and in the crystallised matrix. The quartz inclusions in garnet suggest that the prograde path of the xenolith passed through the quartz stability field at >4 kb at 600 degrees. The crystallisation of the matrix containing quartz, suggests that there was some melting at the peak metamorphic grade, the presence of melt is shown in Figure 47.
The peak metamorphic conditions of sample BG2 show a large range from 750 up to possibly 950 degrees and 10 kb.

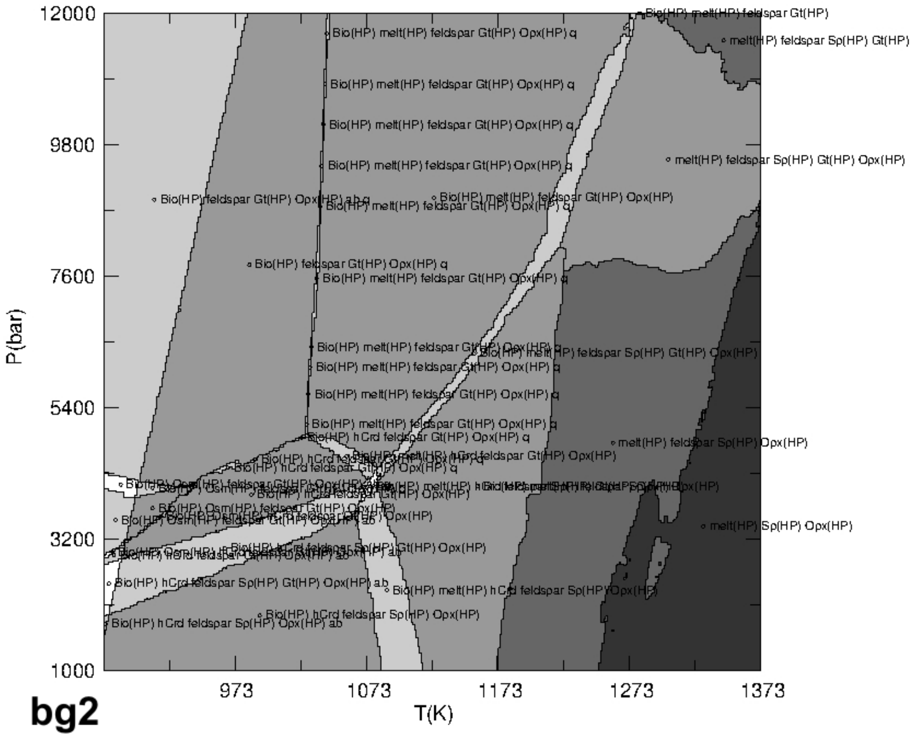


Figure 46 Pseudosection calculated with Perplex based on an estimated original bulk composition of sample BG-2. Table 13 shows the bulk compostion used for the pseudosection.

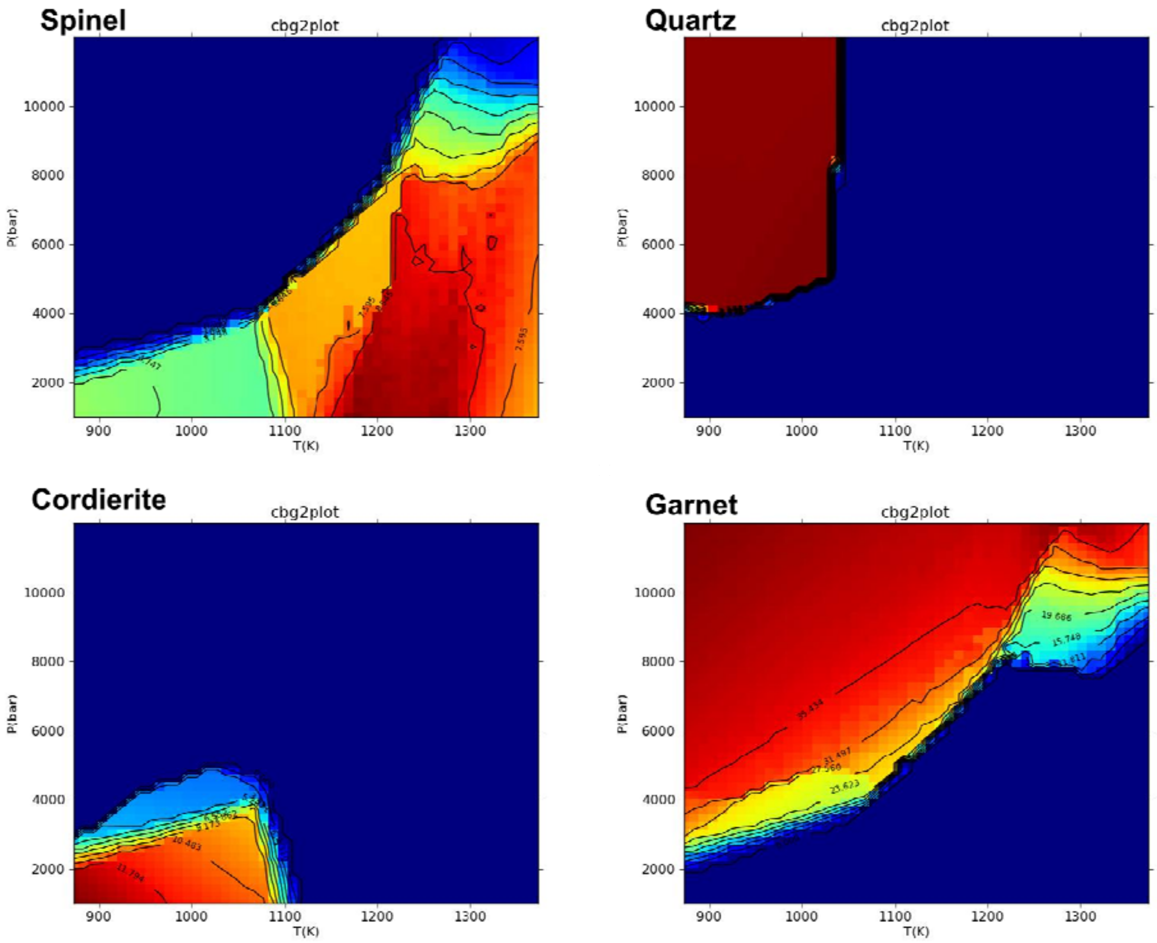


Figure 47 Stability fields of spinel, quartz, cordierite and garnet in the pseudosection of sample BG-2.

Symplectite formation

The breakdown of garnet, forming the symplectite, is calculated using an average garnet composition, as it is clearly an isochemical reaction (with the exception of minor Na), and an average composition based on a linescan through a symplectite from sample TA-12. Figure 48 shows the pseudosections with a garnet composition. The stability fields of garnet, spinel orthopyroxene and anorthite are shown in Figure 49. The pseudosections show that garnet is stable in a large P-T area, and due to decompression breaks down to form orthopyroxene, spinel and anorthite, as observed in the thin sections. This breakdown reaction is thus a decompression reaction. Depending on composition the breakdown can start at 4 –2 kb at 600 degrees and 7.5 – 6.5 kb at 1100 degrees. In the pseudosection crd is also seen as a product of the breakdown at lower temperatures, so its absence can be regarded as an indication of minimum temperature of approximatly 900 degrees.

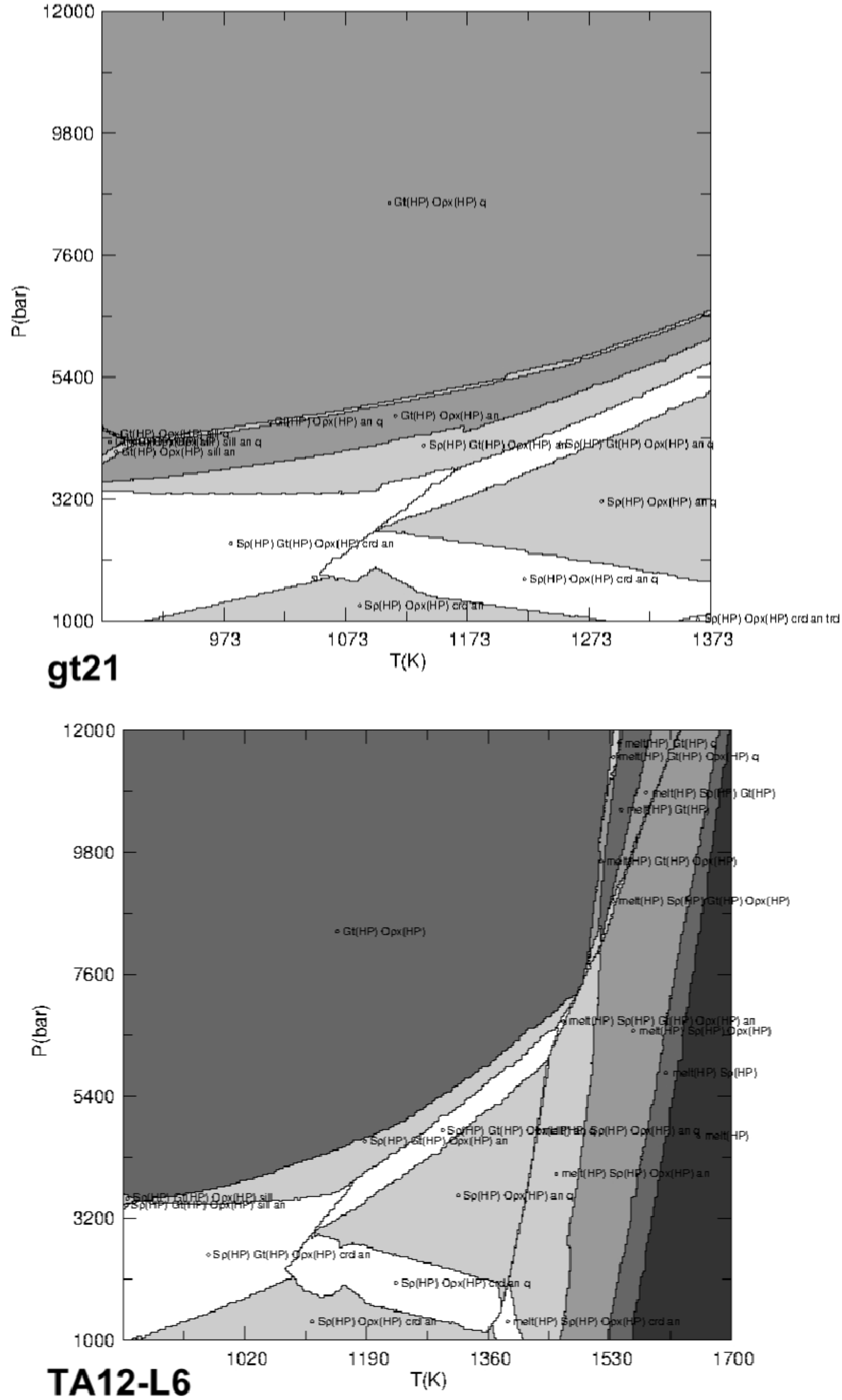


Figure 48 Pseudosections calculated with Perplex. Pseudosection gt21 is based on an average garnet composition of the garnet grains found in the thin sections from both Bou Ibalghatene and Tafraoute. Pseudosection TA12_L6 is based on the average composition of

a linescan through a symplectite in sample TA-12. Table 13 shows the compositions used for the pseudosections.

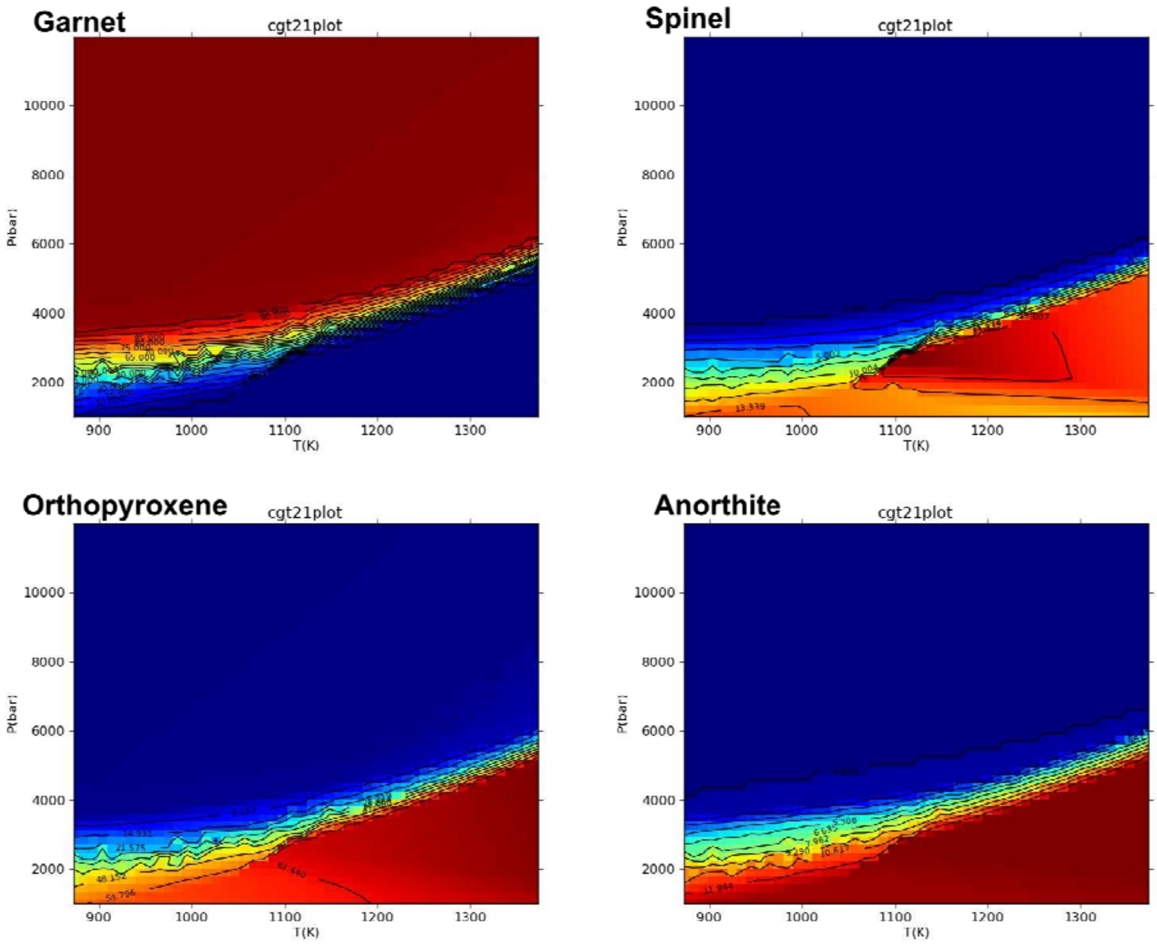


Figure 49 Stability fields of garnet, spinel, orthopyroxene and anorthite in pseudosection gt21.

Speed of reaction

With the diffusion of elements in garnet it is possible to make a first estimate of the speed of some of the processes the xenoliths underwent. The two stages of which the speed can be estimated are the cooling period after the peak metamorphism (stage 3 in the PT-path), and the stage of xenolith- magma interaction and transport to the surface (stage 4 in the PT-path).

Stage 3

To estimate the period of cooling after the peak metamorphism I used the formula from Spear:

$t = h^2/D$.

Where t is the time in seconds, h the diffusion path in μm and D the diffusion coefficients after Gangully 1998. At peak metamorphic conditions large garnet grains are present. During the cooling period the garnets underwent complete homogenisation through diffusion. Using the above formula it is possible to estimate the length of the cooling period. Table 14 shows the estimated time of diffusion for homogenisation over 1000 and 2000 mu for a range of temperatures. The homogenisation of Fe takes more time than the homogenisation of Mg. Because both elements are homogeneously distributed in the garnet grains, the time for homogenisation of Fe gives the minimum period of time required. For a garnet grain of 1000 mu this is already 8.33 Ma and for a garnet grain of 2000 mu 33.3 Ma, at 1057 degrees. From the PT-path of the xenoliths it is seen that the homogenisation took place during the cooling period, after peak metamorphism. The temperature went from approximately 900-950 degrees to 600-700 degrees for all samples. There is no diffusion coefficient known for these temperatures but based on the trend of diffusion coefficients as a function of temperature (Table 14) it is seen that the diffusion will be significantly lower. If the diffusion coefficient at 900 degrees is ten times lower than the one at 1057 degrees (from 1150 to 1100 and 1100 to 1057 degrees the diffusion coefficient decreases approximately by 90 %), the cooling period will increase to 83 Ma for 1000 mu and 333 Ma for 2000 mu.

Stage 4

After the xenoliths were heated by the host magma, they were transported to the surface, forming a symplectite around the garnet grains on the way up. From the element mapping done on the garnet symplectite rim with SEM-EDS, Figure *29*, Figure *30*, it is seen that Mg is reequilibrated in the symplectite, whereas Fe is still in its original place. The diffussion of Fe and Mg in the symplectite can be used to make an estimation of the speed of the reaction. The symplectite consists of very small minerals with a width of 2-5 mu. In the minerals Mg is reequilibrated, and Fe is not, as is evident from the elemant maps. This means that the diffusion of Mg was fast enough for reequilibration in the reaction time, and the diffusion of Fe was too slow to reequilibrate. From this we can get a time range in which the reaction took place, and also an estimation of the time of the transport of the xenolith to the surface. Table 14 shows the estimated time for diffusion of Fe and Mg over a width of 2 and 5 mu. For the estimation of the time of diffusion it is important to know the temperature. The temperature of the xenolith is thought to been raised to the host magma temperature. Alkali basalt can have a temperature up to 1400 degrees at depth (Spera 1984). Assuming the xenolith had a temperature of 1400 degrees, the reaction only took place in a few days, taking a width of 2 mu. With a width of 5 mu the reaction time was between 7 and 114 days at 1432 degrees. Even if the xenolith was at lower temperatures the reaction time is still below 150 days at temperatures from 1150 degrees.

A

h(mu) 1000	D (10^-15 cm2/s)			from Mg diffusion	from Fe diffusion
T (oC)	Mg	Fe		Ma	Ma
1432	396.5	26.5		0.001	0.013
1375	75.5	15.5		0.004	0.022
1344	65.4	5.4		0.005	0.062
1280	6.5	3.5		0.051	0.095
1250	28.3	3.3		0.012	0.101
1200	28	3.5		0.012	0.095
1150	8.7	4.7		0.038	0.071
1100	3.4	0.4		0.098	0.833
1057	1.2	0.04		0.278	8.333

B

h(mu) 2000	D (10^-15 cm2/s)			from Mg diffusion	from Fe diffusion
T (oC)	Mg	Fe		Ma	Ma
1432	396.5	26.5		0.003	0.050
1375	75.5	15.5		0.018	0.086
1344	65.4	5.4		0.020	0.247
1280	6.5	3.5		0.205	0.381
1250	28.3	3.3		0.047	0.404
1200	28	3.5		0.048	0.381
1150	8.7	4.7		0.153	0.284
1100	3.4	0.4		0.392	3.333
1057	1.2	0.04		1.111	33.333

C

h(mu) 5	D (10^-15 cm2/s)			from Mg diffusion	from Fe diffusion
T (oC)	Mg	Fe		yr	yr
1432	396.5	26.5		0.021	0.314
1375	75.5	15.5		0.110	0.538
1344	65.4	5.4		0.127	1.543
1280	6.5	3.5		1.282	2.381
1250	28.3	3.3		0.294	2.525
1200	28	3.5		0.298	2.381

1150	8.7	4.7		0.958	1.773
1100	3.4	0.4		2.451	20.833
1057	1.2	0.04		6.944	208.333

D

h(mu) 2	D (10^-15 cm2/s)			from Mg diffusion	from Fe diffusion
T (oC)	Mg	Fe		yr	yr
1432	396.5	26.5		0.003	0.050
1375	75.5	15.5		0.018	0.086
1344	65.4	5.4		0.020	0.247
1280	6.5	3.5		0.205	0.381
1250	28.3	3.3		0.047	0.404
1200	28	3.5		0.048	0.381
1150	8.7	4.7		0.153	0.284
1100	3.4	0.4		0.392	3.333
1057	1.2	0.04		1.111	33.333

Table 14 A estimated time of diffusion for homogenisation over 1000 mu. B estimated time of diffusion for homogenisation over 2000 mu. C estimated time of diffusion over a width of 5 mu. D estimated time of diffusion over a width of 2 mu.

PT-path

From the gathered thermobarometric information a PT-path for the xenoliths can be constructed. The path is given per location and type of xenolith.

Tafraoute

A PT-path is constructed for the xenoliths from Tafraoute of the type paragranulite with garnet and sillimanite. The path shows 4 steps which are explained below.

1. The prograde path of the xenolith is derived from Perplex modeling. The inclusions in garnet show the mineral assemblage which was stable before the peak metamorphism. The path goes through a shallow band were sillimanite is stable and cordierite is absent, to the higher temperatures and pressures of the metamorphic peak conditions.
2. The metamorphic peak conditions are given by the main mineral assemblage of the rock together with the relict corundum and the crystallisation temperature of a two-

feldspar assemblage. The metamorphic peak is found with perplex modeling, were the main mineral assemblage is stable including corundum. The minimum temperature for the metamorphic peak is given by the crystallisation temperature of a two-feldspar subassemblage, 916 degrees. Also the metamorphic recrystallisation of the large sillimanite with kink bands suggests high temperatures (Arima and Barnett 1984, Kriegsman- pers. comm.).

3. The feldspar crystallisation is the start of a period of cooling of the xenolith. The crystallisation temperature is ~916 degrees and feldspar exsolution shows a temperature decrease to at least 720 degrees. There is no information on the pressure from the feldspar exsolution, but sillimanite from the main mineral assemblage remains stable and thus gives us a maximum pressure of 8 kb at 720 degrees. This shows that a small decrease in pressure from the peak metamorphic conditions is a possibility
4. The last stage of the path is retrieved from garnet and biotite breakdown in the xenoliths. These are both decompression reactions. The garnet breakdown reaction forming a symplectite is probably a reaction at high temperatures. The absence of coridierite gives a minimum temperature of 900 degrees. It is likely that the xenolith was first heated to high (up to host magma T) temperatures and was then transported to the surface with the magma, forming the symplectite on the way up between 7.5 and 2 kb depending on the temperature, at high temperatures the pressure is also higher (this is further discussed in the discussion).

Stages 1-3 of the path are considered to be representative for the lower crust under Tafraoute, and the last stage (4) represents magma upwelling and finally the eruption.

Bou Ibalghatene

Two PT-paths have been constructed for the two differentt xenolith types from Bou Ibalghatene. The PT-path of the orthogranulite with garnet shows 4 steps, described below.

1. The prograde path of the xenolith is derived from Perplex modeling. The inclusions in garnet show the mineral assemblage which was stable before the peak metamorphism. It is essentially the same path as the one followed by the xenoliths from Tafraoute. The path goes through a shallow band where sillimanite is stable and cordierite is absent, to the higher temperatures and pressures of the metamorphic peak conditions.
2. The metamorphic peak conditions are given by the main mineral assemblage of the rock, pl + grt + zn-spl + crn + TiMa. The metamorphic peak conditions were modelled with Perplex and TWQ, and show high temperature and pressures, above 900

degrees at 10 kb. The metamorphic peak of the orthogranulite with garnet type is slightly higher than the metamorphic peak of the paragranulites with garnet and sillimanite from Tafraoute. Sillimanite is stable as a major phase in Tafraoute, but in orthogranulite with garnet from Bou Ibalghatene it is only found as an inclusion phase. This probably reflects the different bulk compositions of the rock types and the higher pressure and temperature of the rocks at Bou Ibalgahtene. Garnet, spinel and corundum are stable together and the absence of sapphirine gives the minimum pressure and maximum temperature of the assemblage. At a pressure of 10 kb the maximum temperature is 1100 degrees.

3. Themain assemblage does not provide direct evidence for a cooling period in the sample. But ternary feldspar grains present in the thin sections show exsolution patches, and other samples showing this exsolution record cooling to 600 degrees (Bou Ibalghatene) and 720 degrees (Tafraoute).
4. The last stage of the path is retrieved from garnet and biotite breakdown in the xenoliths. These are both decompression reactions. The garnet breakdown reaction forming a symplectite is probably a reaction at high temperatures. The absence of coridierite gives a minimum temperature of 900 degrees. It is likely that the xenolith was first heated to high (up to host magma T) temperatures and was then transported to the surface with the magma, forming the symplectite on the way up between 7.5 and 2 kb depending on the temperature, at high temperatures the pressure is also higher (this is further discussed in the discussion).

Stages 1-3 of the path are considered to be representative for the lower crust under Bou Ibalghatene, and the last stage (4) represents magma upwelling and finally the eruption.

The second sample from Bou Ibalghatene is a orthogranulite with garnet and orthopyroxene. The PT-path of this sample is described below:

1. The prograde path of the xenolith is derived from Perplex modeling. The inclusions in garnet show the mineral assemblage present before peak metamorphism. The prograde path goes through the quartz stability field, whereas cordierite was absent.
2. The metamorphic peak conditions from the Perplex modelling show a large range from 750 up to possibly 950 degrees at 10 kb. This high temperature is consistent with the temperature derived from the feldspar exsolution which started at 900 degrees. This suggests that the peak temperature was in the range of 900-950 degrees at a pressure of 10 kb.
3. The cooling path of the xenolith is recorded by feldspar exsolution and orthopyroxene-garnet thermobarometry. The feldspar exsolution shows a cooling

path from 900 to 600 degrees. Orthopyroxene-garnet thermobarometry gives a temperature of around 650 degrees, and the pressure ranges from 6.5 to 9.5 kb.

4. The last stage of the path is retrieved from garnet and biotite breakdown in the xenoliths. These are both decompression reactions. The garnet breakdown reaction forming a symplectite is probably a reaction at high temperatures. The absence of coridierite gives a minimum temperature of 900 degrees. It is likely that the xenolith was first heated to high (up to host magma T) temperatures and was then transported to the surface with the magma, forming the symplectite on the way up between 7.5 and 2 kb depending on the temperature, at high temperatures the pressure is also higher (this is further discussed in the discussion).

Stages 1-3 of the path are representative for the lower crust under Bou Ibalghatene, and the last stage (4) represents magma upwelling and finally the eruption.

The xenoliths from Bou Ibalghatene and Tafraoute all have approximatley the same PT-path. This is shown in Figure 50.

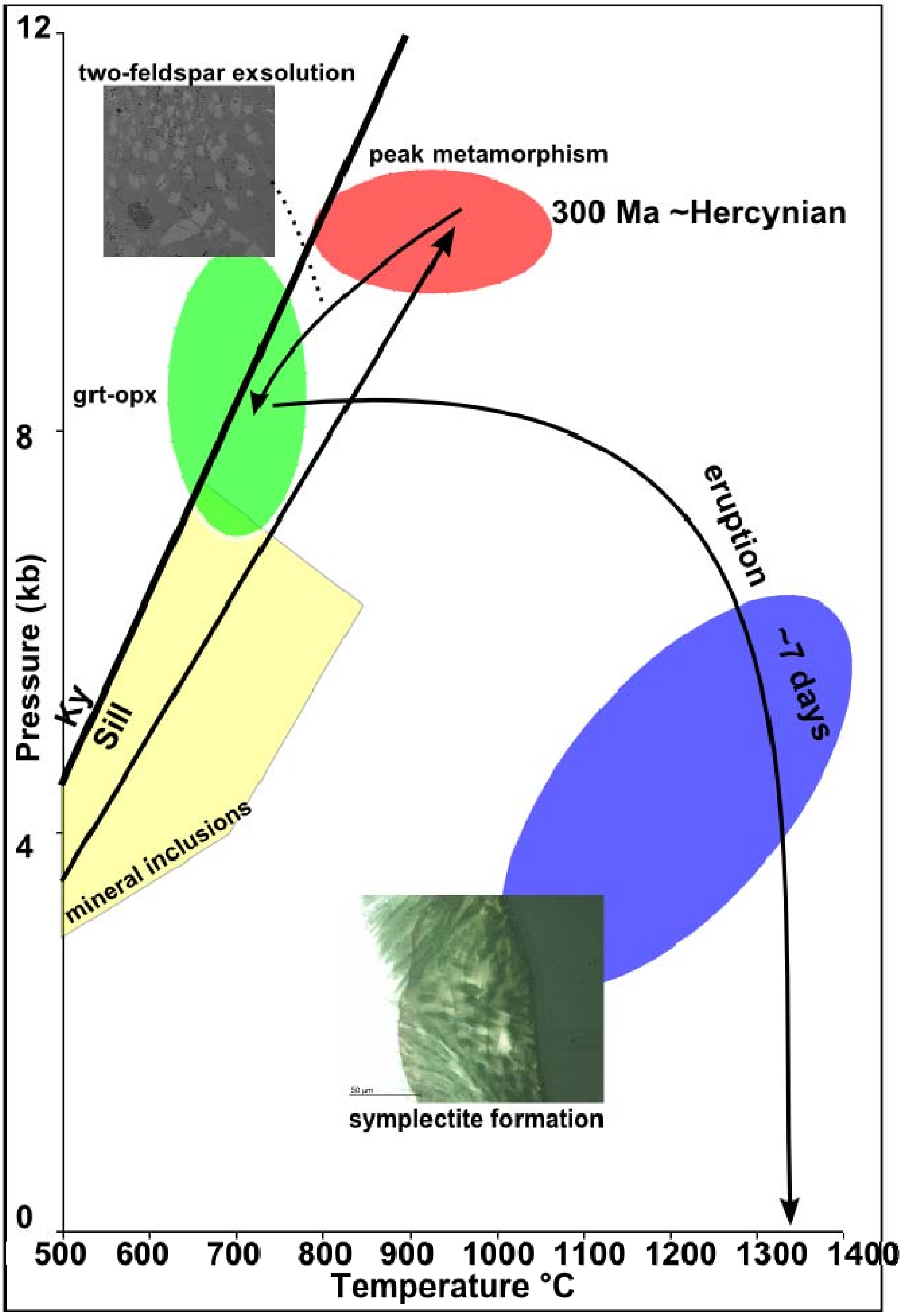


Figure 50 PT-path of the xenoliths from Bou Ibalghatene and Tafraoute.

Ultra High Temperature Metamorphism

The crustal xenoliths have gone through two periods of high temperature metamorphism: (i) the peak metamorphism of the original host rock that the xenoliths originated from; and (ii) the high temperature decompression during transport of the xenoliths to the surface. The peak metamorphism was a high temperature process which probably affected the entire lower crust, while the second metamorphism is only recorded in some minerals of the xenoliths. The garnet-orthopyroxene thermobarometry, two-feldspar thermometry and modelling with TWQ and Perplex all provide estimates of the early high temperature conditions. In addition there is some other, circumstantial, evidence which may indicate high temperature metamorphism.

According to Harley, 2008, crustal rocks undergo ultra high temperature (UHT) metamorphism when they are subjected to temperatures of 900-1100 degrees at pressures of 7-13 kbar. The results of this thesis suggest that the lower crust below the Middle Atlas has undergone UHT metamorphism, since the temperatures recorded are indeed in the proper range of 900-1000 degrees at pressures around 10 kbar. Also the metamorphism as a result of the heating of the xenoliths and transport to the surface can be regarded as UHT, but at lower pressures of 2-7.5 kbar. The latter is not a regional event, but reflects the contact metamorphism of xenoliths in hot magma, combined with a decompression due to the transport of the xenolith to the surface.

Harley 2008, states that evidence for UHT metamorphism is recorded in mineral assemblages formed in magnesian pelites, suported by high temperature indicators including mesoperthitic feldspar and aluminous orthopyroxene. Mesoperthitic feldspar is present in almost all samples, and indeed gives very high temperatures by two-feldspar thermometry. Aluminous orthopyroxene is found in the symplectite around the garnet. The aluminium content of the orthopyroxene is up to 17 wt% Al_2O_3, being very extreme values. High values of aluminium content mentioned by Harley, 2004, have a maximum of 12 wt%.

UHT metamorphism is the most thermally extreme type of crustal metamorphism and commonly occurs in Mg-Al rich rock compositions, which are relatively rare in nature (Kelsey, 2008). The world map of UHT metamorphism (Figure 51) localities from Kelsey, 2008, shows 46 locations where UHT metamorphism has been ducumented. The lower crust of the Middle Atlas can now be added to these localities.

Biotites are rich in TiO_2 (4.6-6.7 wt%) which could be an indication of UHT metamorphism. According to Kawasaki et al. 2011, biotite which are so rich in TiO_2 occur above 1000 degrees. But biotite in xenoliths from El Hoyazo also contain TiO_2 up to 6.4 wt% at approximately 850 degrees (Alvarez-Valero et al. 2007).

Sillimanite grains are very large, up to 1.5 mm in size, and they show kink bands. This is probably due to metamorphic recrystallisation at high temperatures. Kink bands in sillimanite are found at temperatures of 860-890 degrees by Arima and Barnett, 2004 in the Pikwitonei granultite terrain, Canada, and are also found in granulites from Sri Lanka at 900-950 degrees at 9-10 kb (Kriegsman- pers. comm.). Also sillimanites have a small amount of FeO, of 1-2 wt%. Yokoi, 1983 reported that the content of Fe_2O_3 in sillimanite increases with metamorphic grade.
In one sample, LKPTAF4, garnet contains inclusions of both quartz and spinel closely together. If the two were co-existing, it can also be an indication of UHT (Kelsey, 2008). However the high contents of ZnO in spinel grains present in the matrix and as inclusion in garnet, show that spinel was stable towards lower temperatures (Ghosh et al. 2000; Tajcmanova et al. 2009).
Not all these indicators are present only at UHT, or have not yet been defined sufficiently. But all these indications for (U)HT together suggests that there were indeed a (ultra) high-temperature/low-pressure metamorphic conditions at the peak of metamorphism in the Middle Atlas. This contrasts very strongly with the metamorphic conditions of the rocks at the Moroccan surface.

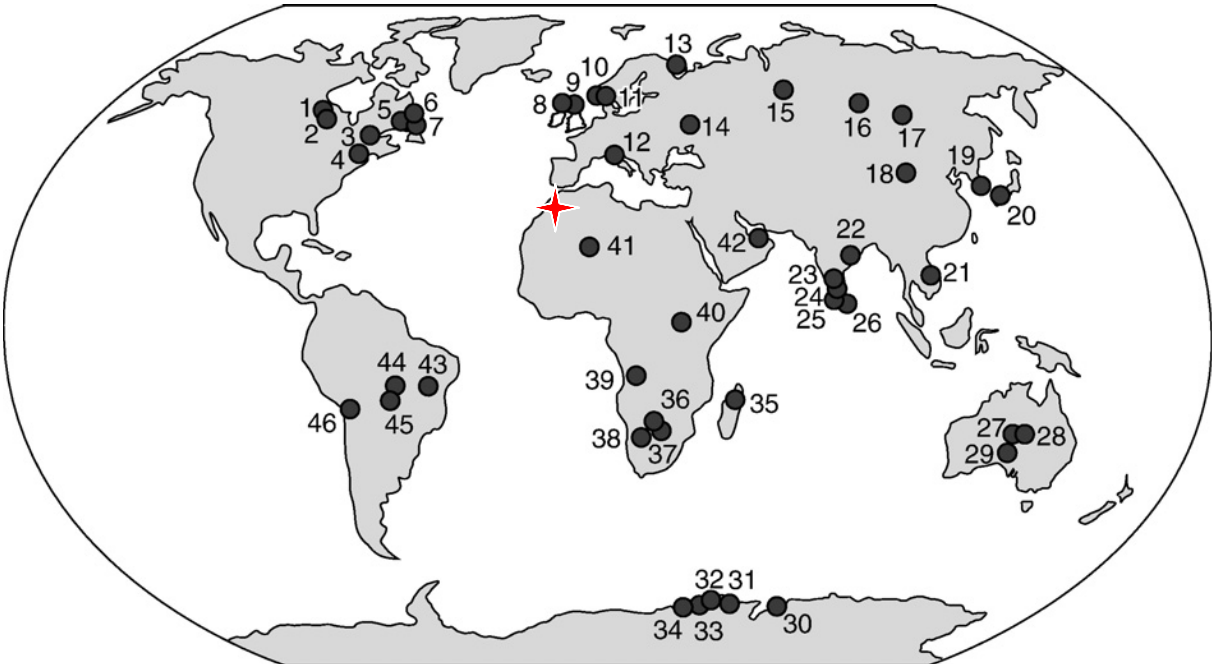


Figure 51 World map of ultrahigh-temperature metamorphic localities, red star indicating the Middle Atlas, modified after Kelsey 2008

Origin of the xenoliths and their transport to the surface

With xenoliths it is important that one can distinguish the processes which occured in the original host rock of the xenolith, and those that occured during the residence of the xenolith in the host magma. The metamorphic stages which the xenolith has undergone can tell something about the lower crust of the Middle Atlas (stage 1-3), and the last stage (stage 4) gives information on the xenolith –host magma interaction and the transport to the surface therein.

Three types of crustal xenoliths collected at Bou Ibalghatene and Tafraoute are thought to originate from the lower crust of the Midlle Atlas:

- Orthogranulite with garnet (Bou Ibalghatene)
- Orthogranulite with garnet and orthopyroxene (Bou Ibalghatene)
- Paragranulite with garnet and sillimanite (Tafraoute)

The other xenolith type:

- Orthogranulite without garnet (Bou Ibalghatene and Tafraoute)

does not give any P-T information. But this rock type may come from the middle crust.

At Bou Ibalghatene and Tafraoute also many mantle xenoliths have been found (Moukadiri 1999, Raffone et al. 2009, Wittig et al. 2010a,b). This means that the xenoliths come from different levels of the crust and mantle. They can become incorporated into the magma from the wall of a magma chamber or from the wall of the magma conduit.

Xenoliths transported with the magma may go up very fast. Xenoliths are heavier than the magma and are supposed to sink. But if the ascent rate of the magma is fast enough they may get to the surface and/or if the flow is turbulent due to degassing. The time it takes to transport a xenolith upwards is in the range of hours to days (Spera 1984; Klugel 1998). The symplectite formation, a decompressional reaction of garnet, occured between 7.5 and 2 kb at very high temperatures. But the speed of reaction, which is calculated by the diffusion of Fe and Mg in garnet suggests that it took several days to months. Combining the two approaches, the best estimate for the time it took for the xenoliths to travel to the surface is thus in the order of days. Alternatively, the breakdown reaction could have happened during the residence in a magma chamber between 7.5 and 2 kbar for a few months, however in this scenario we would expect to find mid-crustal xenoliths as well. The thickness of the symplectite differs for the different xenoliths, but are approximately the same within each xenolith. This can be because the xenoliths did not reside the same amount of time in the magma, or it may reflect original size differences of the xenoliths, with the smallest overheating up faster. Possibly xenoliths where the garnet was almost consumed, were already in the magma chamber for some time, whereas xenoliths with a small symplectite rim may have dropped in just before eruption, and were then transported to the surface.

Degi et al. (2010) find the same decompression reaction of garnet, forming a symplectite of orthopyroxene, spinel and feldspar. But they suggest it represents the extension of the Pannonian basin, between 15 and 30 km depth at high temperature (850– 1050 C) prior to the volcanic transport to the surface. I strongly doubt this scenario because of the speed of the reaction, and think that this is a process which only affected the xenolith in the host magma, and not the host rock of the xenolith, and thus a large part of the crust.

Geodynamic implications

The first three stages recognised in the xenolith give information on the geological history of the lower crust of the Middle Atlas. In one sample monazites are found with enough thorium to date the monazite. There are only limited data points, and the age is not very precise, but the monazites showed an age of around 300 Ma for the peak metamorphism, the hercynian orogeny which affected most of Morocco. The lower crust of the Middle Atlas belongs to the Meseta domain, that can be divided into four zones. The Sehoul block, the coastal block, central Meseta zone and the eastern Meseta zone (Michard et al. 2008). The lower crust beneath the Middle Atlas lies on the border between the central Meseta zone and the eastern Meseta zone. The eastern Meseta zone experienced only low-grade metamorphism (Hoepffner et al. 2005). Whereas the xenoliths show evidence for very high temperature metamorphism at low pressures. The central Meseta domain experienced higher metamorphic grades, greenschist facies, and deformation, this is thought to be related with a high thermal gradient during the deformation (Hoepffner et al. 2005). This corresponds more with the metamorphic peak conditions of the xenoliths, and thus the lower crust than the eastern Meseta, but is still significantly lower. Therefore the lower crust below the Middle Atlas and in particular below Bou Ibalghatene and Tafraoute seems to belong to the central Meseta zone.

The xenoliths found at Bou Ibalghatene and Tafratoute differ in composition, notably the lack of sillimanite in Bou Ibalghatene and its presence in all samples from Tafraoute. A possible explanation for this difference can also come from the central Meseta zone. The central Meseta zone consists of a number of nappes and inliers (Hoepffner et al. 2005; Michard et al. 2010), and possibly the xenoliths originate from two different massifs of the eastern central Meseta. The lower crust below Bou Ibalghatene and Tafraoute both had approximately the same peak metamorphic P-T condition during the hercynian, which was 900-950 degrees at pressures of approximately 10 kb. Which suggests there was UHT metamorphism unlike low-grade metamorphism found at the surface.

After the peak metamorphism there was a period of cooling. This probably continued for several millions of years, at least 8 Ma as deduced from garnet homogenisation. After this period of cooling a second orogeny and a thinning of the lithosphere again resulted in an increase of temperature of the lower crust. The current crustal geotherm (Figure 7) shows temperatures around 800 degrees for the lower crust. The cooling of the lower crust probably continued to a stable geotherm with temperatures around 600-650 degrees, as recorded by orthopyroxene-garnet thermobarometry and two-feldspar thermometry. The cooling period probably stopped at the start of the compressional phase at 50-35 Ma. And the temperatures increased again at 23 Ma when the lithosphere thinning started (Michard et al. 2008). Scattered volcanic activity occured during the middle and late Miocene (15- 6 Ma) in the Middle Atlas (Raffone et al. 2009) and during the Quaternary (1.8- 0.5 Ma) a volcanic chain was formed (Harmand and Cantagrel 1984, El Azzouzie et al. 2010). Bou Ibalghatene and Tafraoute erupted during the Pliocene to Quaternary (Moukadiri and Bouloton 1998, Moukadiri and Pin 1998). This Cenozoic volcanism transported the xenoliths to the surface. Both the volcanism and the thinned lithosphere are responsible for the current geotherm with high temperatures in the lower crust. This last phase of heating of the lower crust is not recognised in the xenoliths, as part of the lower crust. Only the heating, and later decompression of the xenoliths inside the host magma is seen, but this may belong to the same phase.

Conclusions

- The lower crust beneath the Middle Atlas experienced UHT metamorphic conditions beneath Bou Ibalghatene and Tafraoute, of at least 900-950 degrees at 10 kb.
- The metamorphic peak conditions were during the Hercynian at approximately 300 Ma.
- The UHT metamorphic conditions contrast with the metamorphic grade of the hercynic rocks found at the surface in the Meseta’s. The lower crust beneath the Middle Atlas is a new location which can be added to the locations in the world which experienced UHT metamorphism.
- After the metamorphic peak conditions there was a period of cooling to 750-600 degrees.
- The garnet breakdown, forming a symplectite of orthopyroxene, plagioclase and spinel, is a decompression reaction which occured during the transport of the xenolith to the surface.
- The speed of the decompression reaction of garnet forming a symplectite was in the order of days.
- The transport of the xenoliths to the surface was in the order of days.

- Orthopyroxene found in the symplectite has extreme values of aluminium content (up to 17.3 wt%), which may have caused a change in its crystal structure.
- The crustal xenoliths from both Bou Ibalghatene and Tafraoute experienced roughly the same PT-path. The main difference between the rocks is the high amount of sillimanite in crustal xenoliths from Tafraoute and the lack of sillimanite at Bou Ibalghatene
- The xenoliths from Bou Ibalghatene and Tafraoute possibly originate from different massifs of the eastern central Meseta.

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Appendix

Figure 1 TA-29

Figure 2 BG-4C

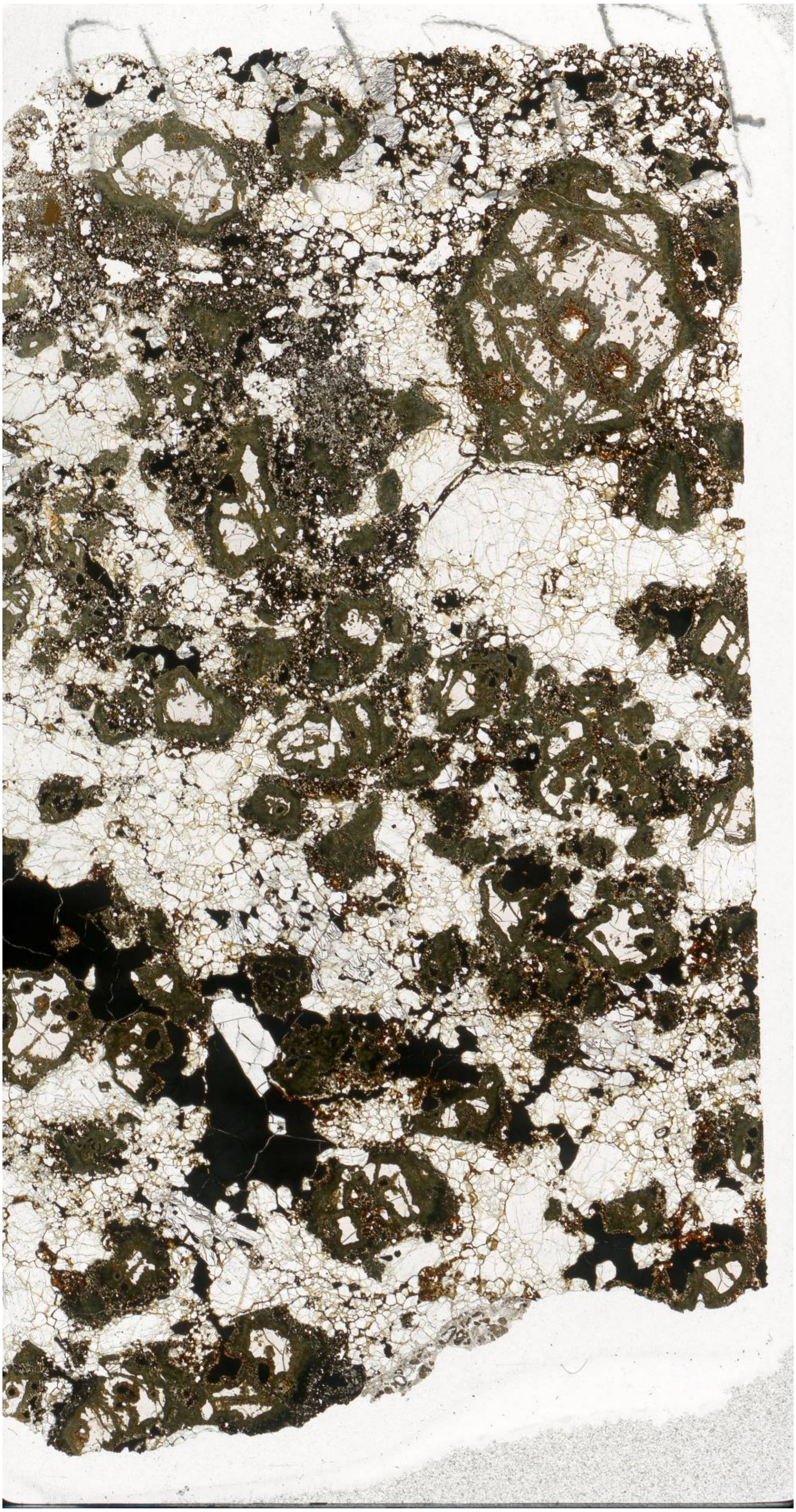


Figure 3 BG-4B

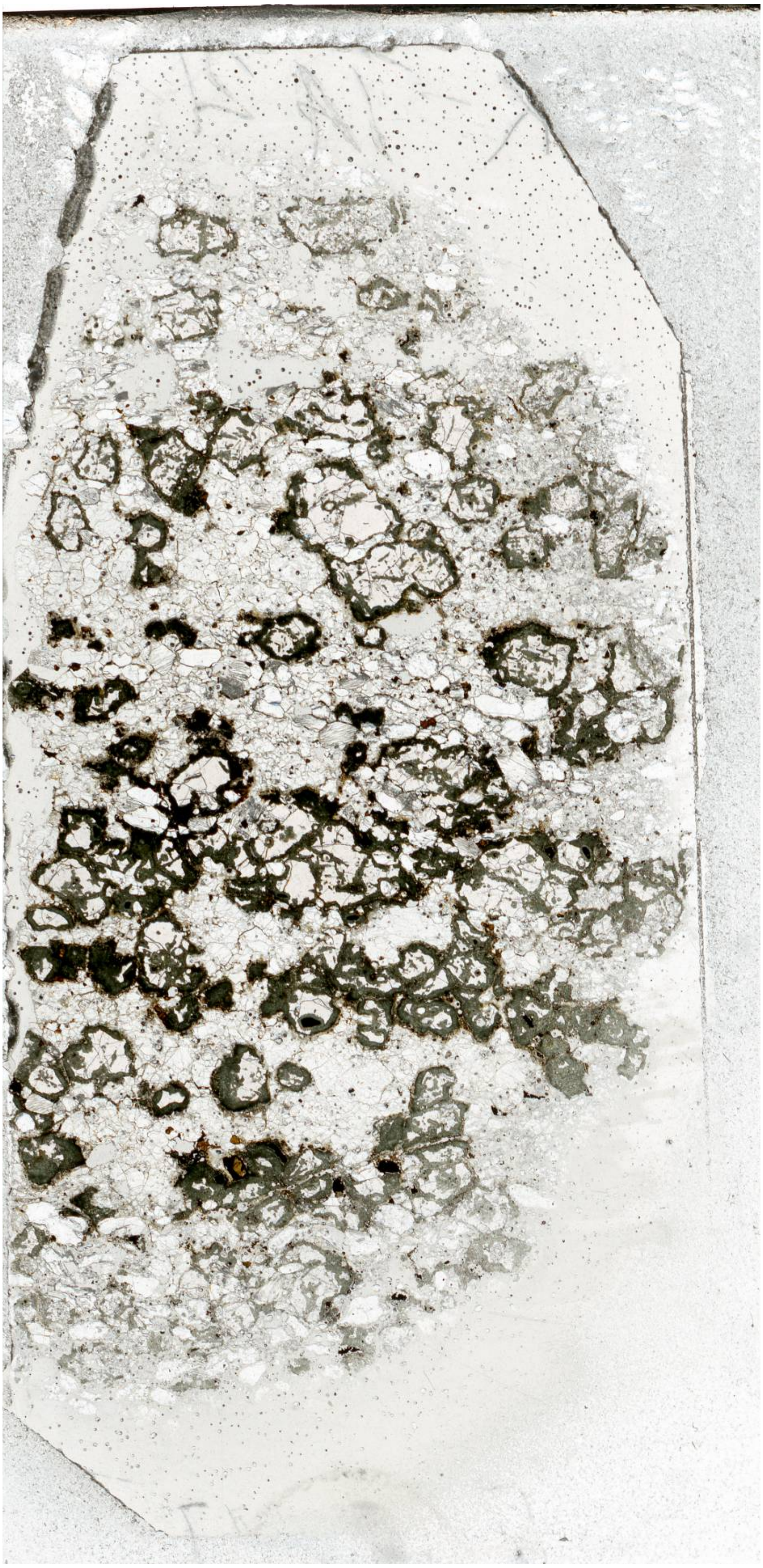


Figure 4 LKTA-21

Figure 5 LKTA-23

Figure 6 TA-12

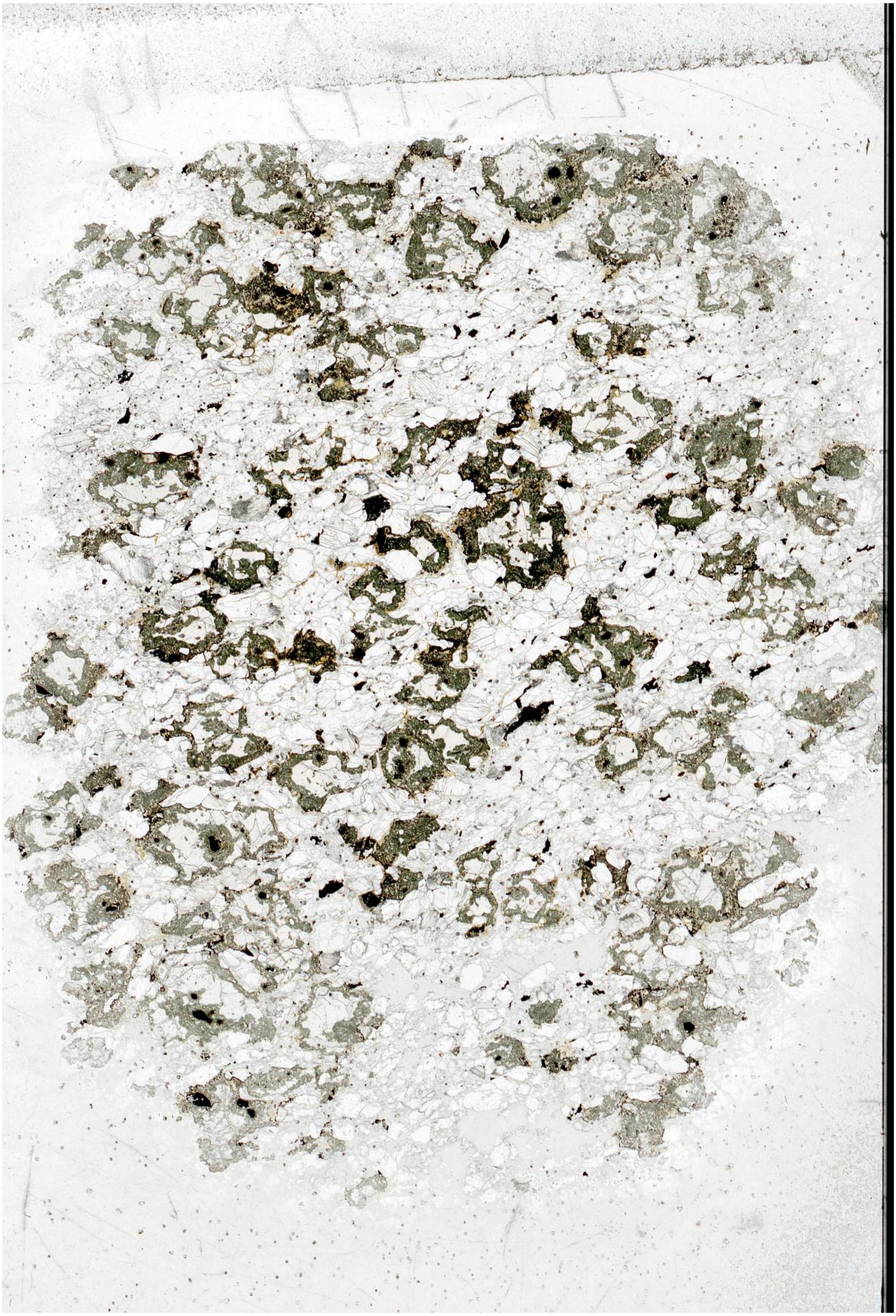


Figure 7 LKTA-14

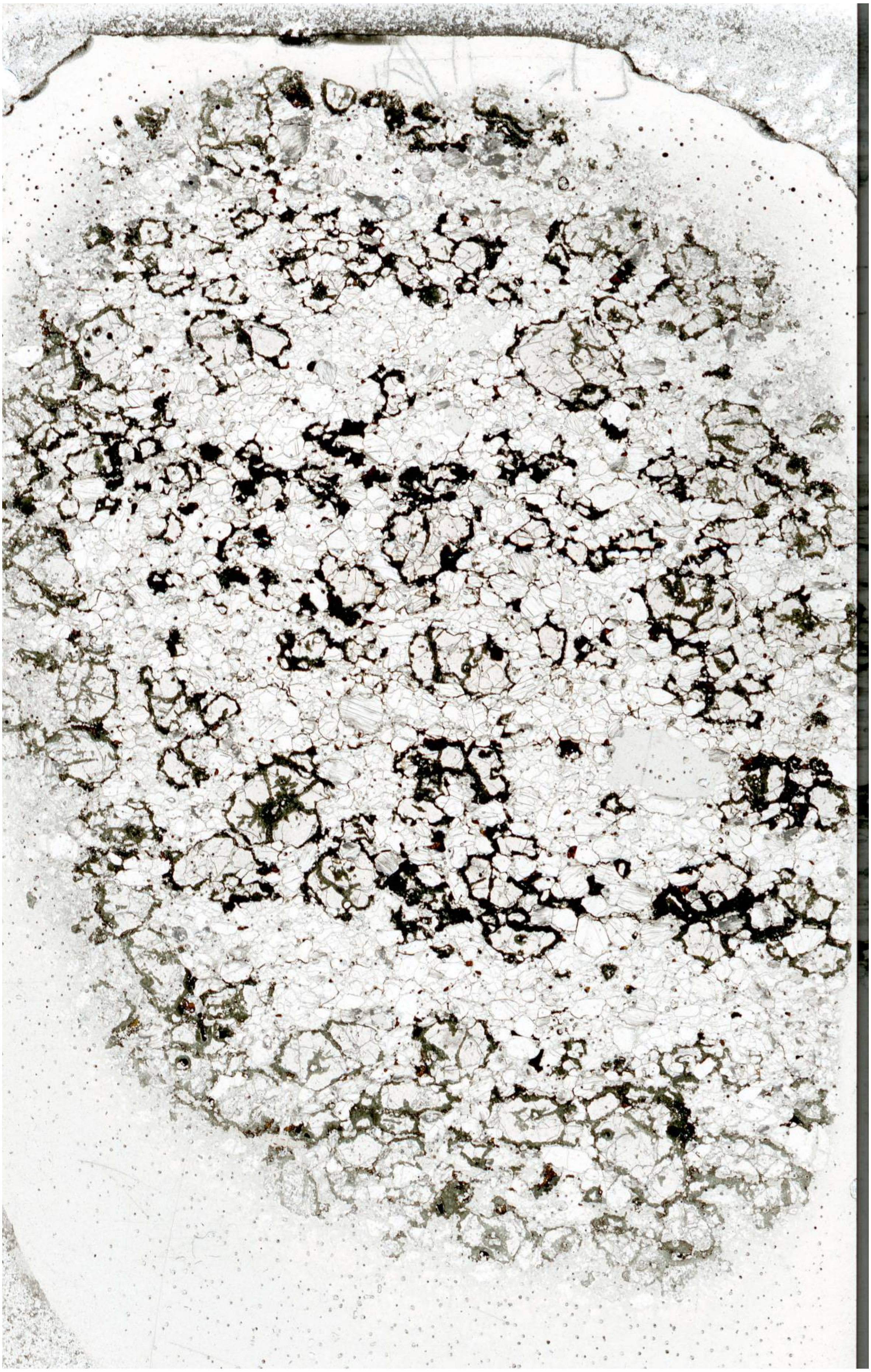


Figure 8 LKTA-20

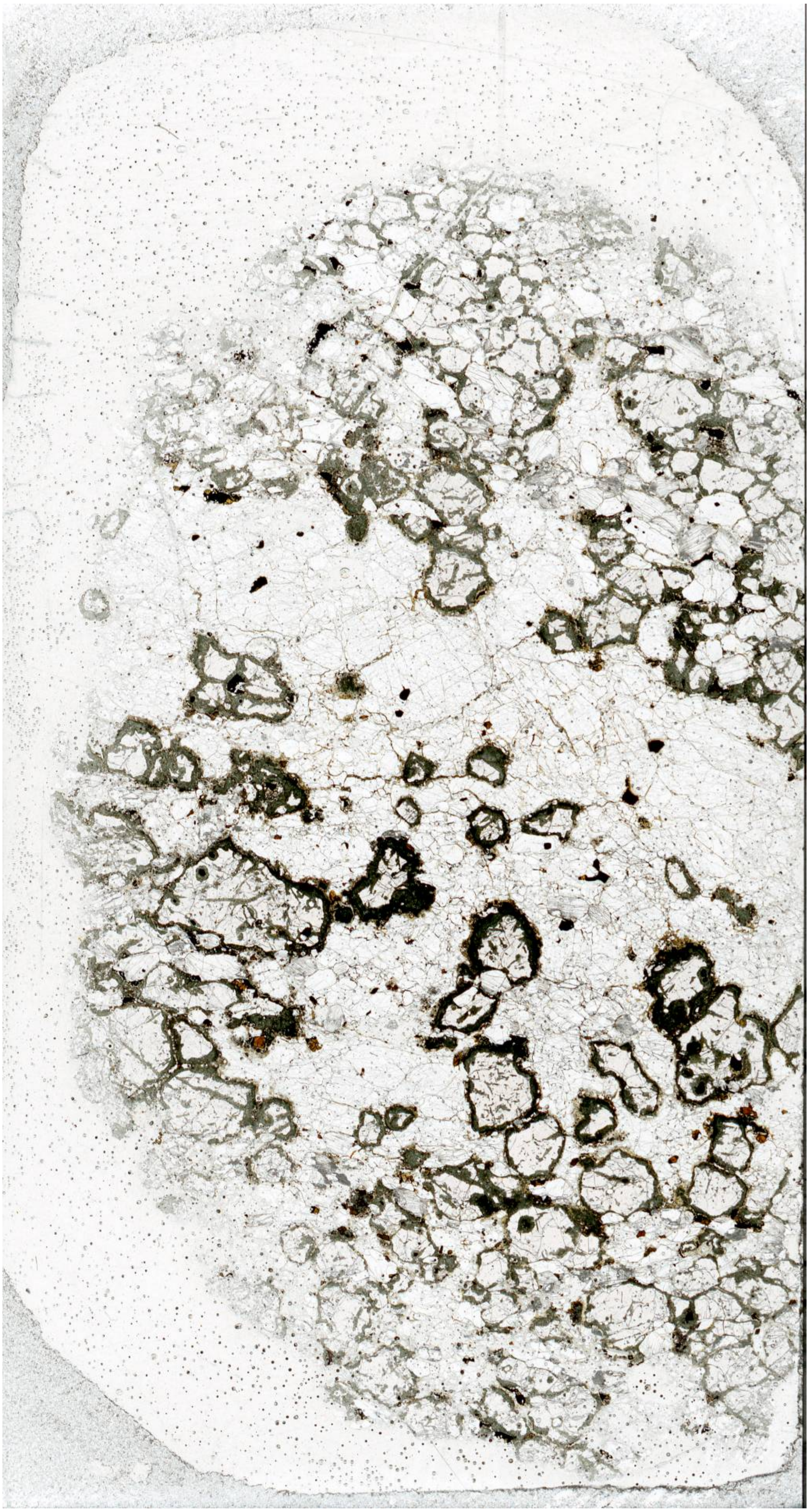


Figure 9 LKTA-38

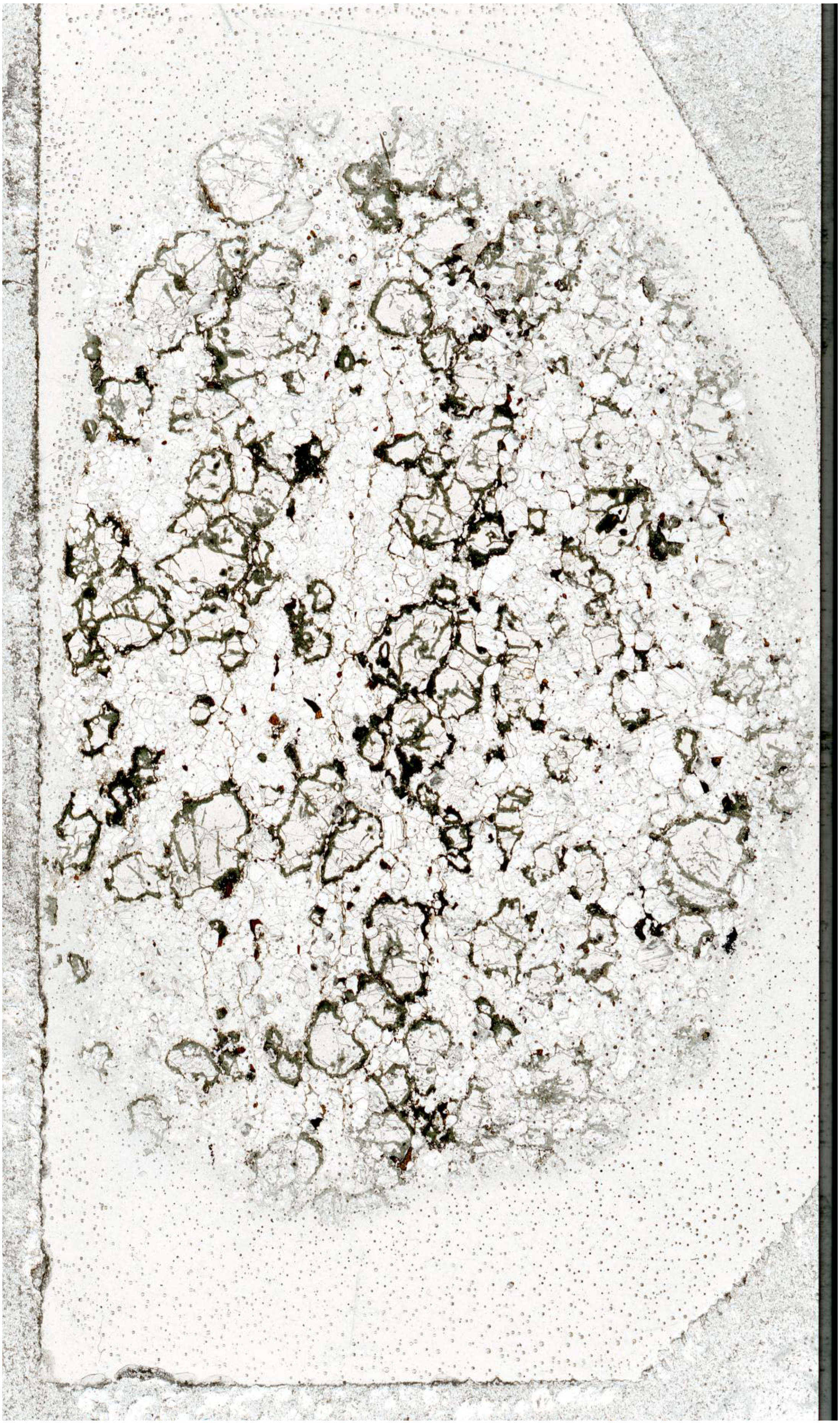


Figure 10 LKTA-24

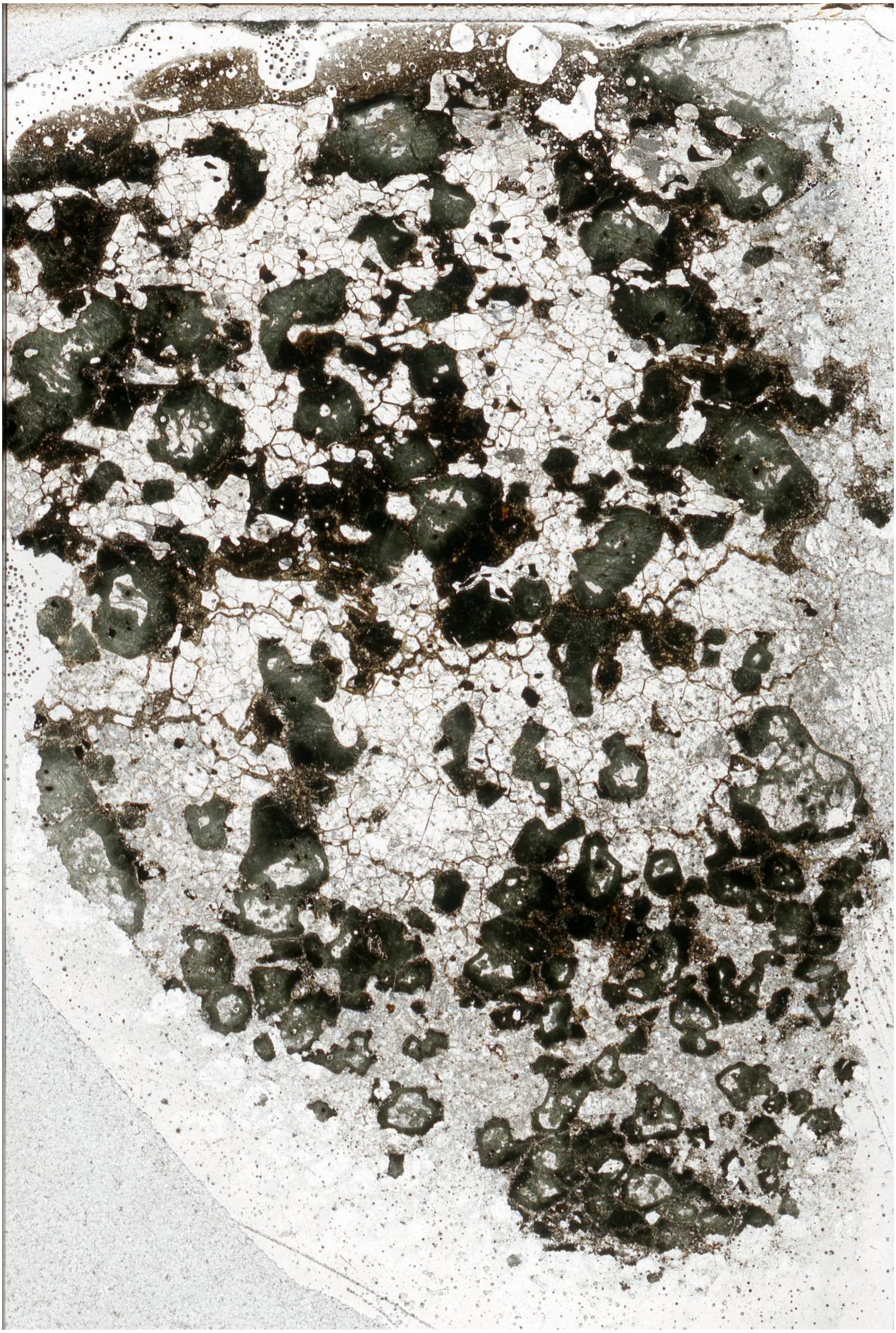


Figure 11 PTAF-30

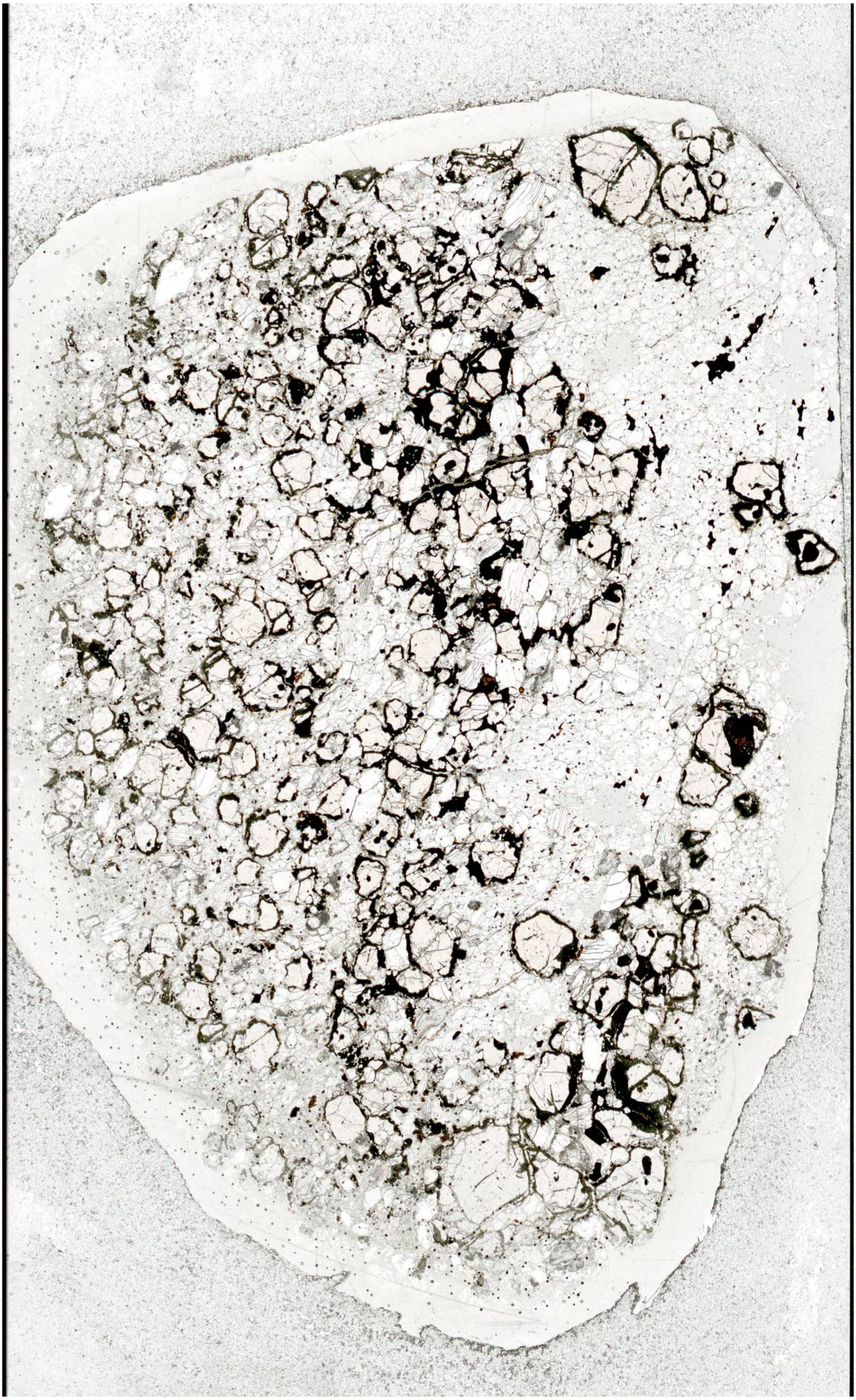
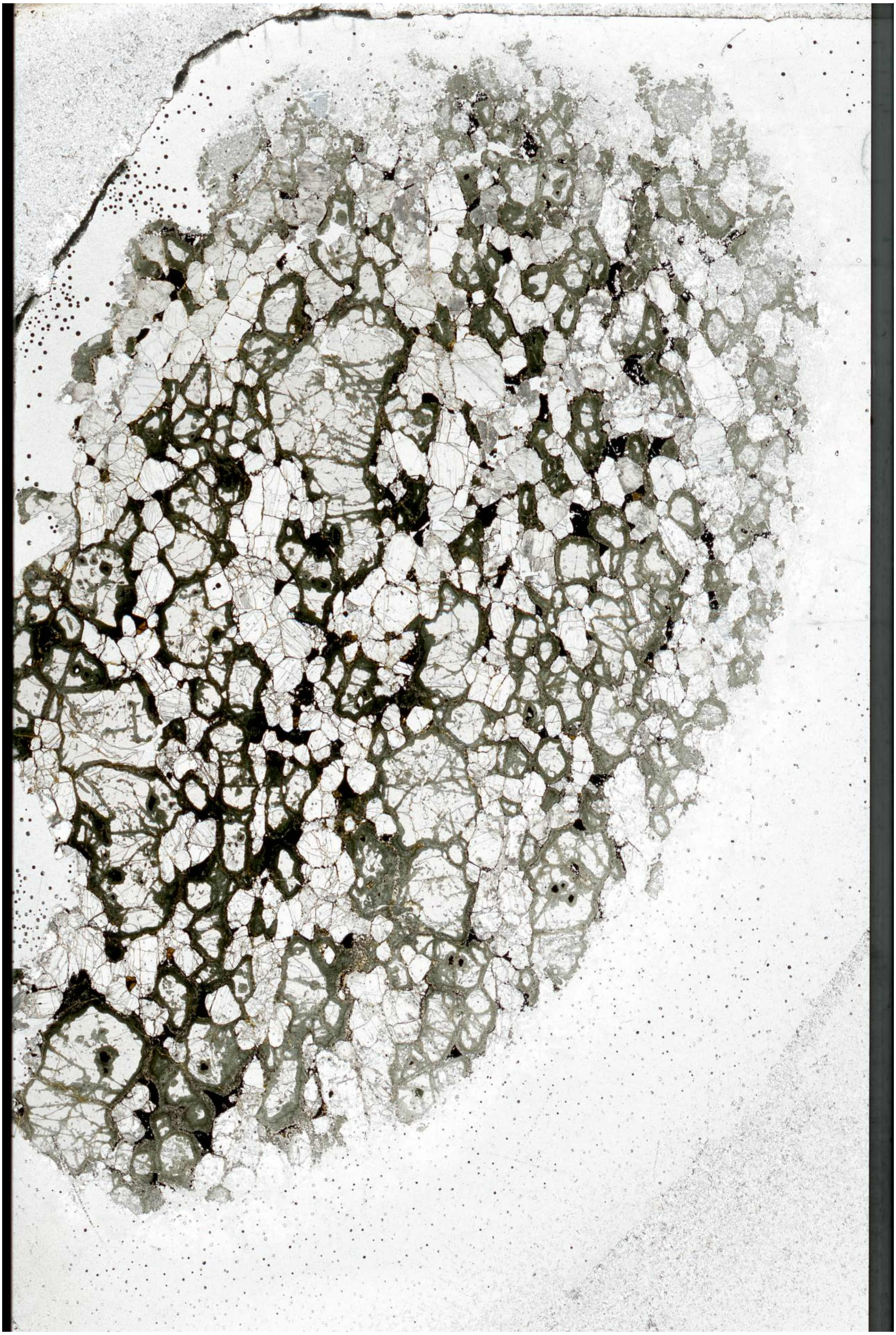


Figure 12 PTAF-3

Figure 13 LKPTAF-4



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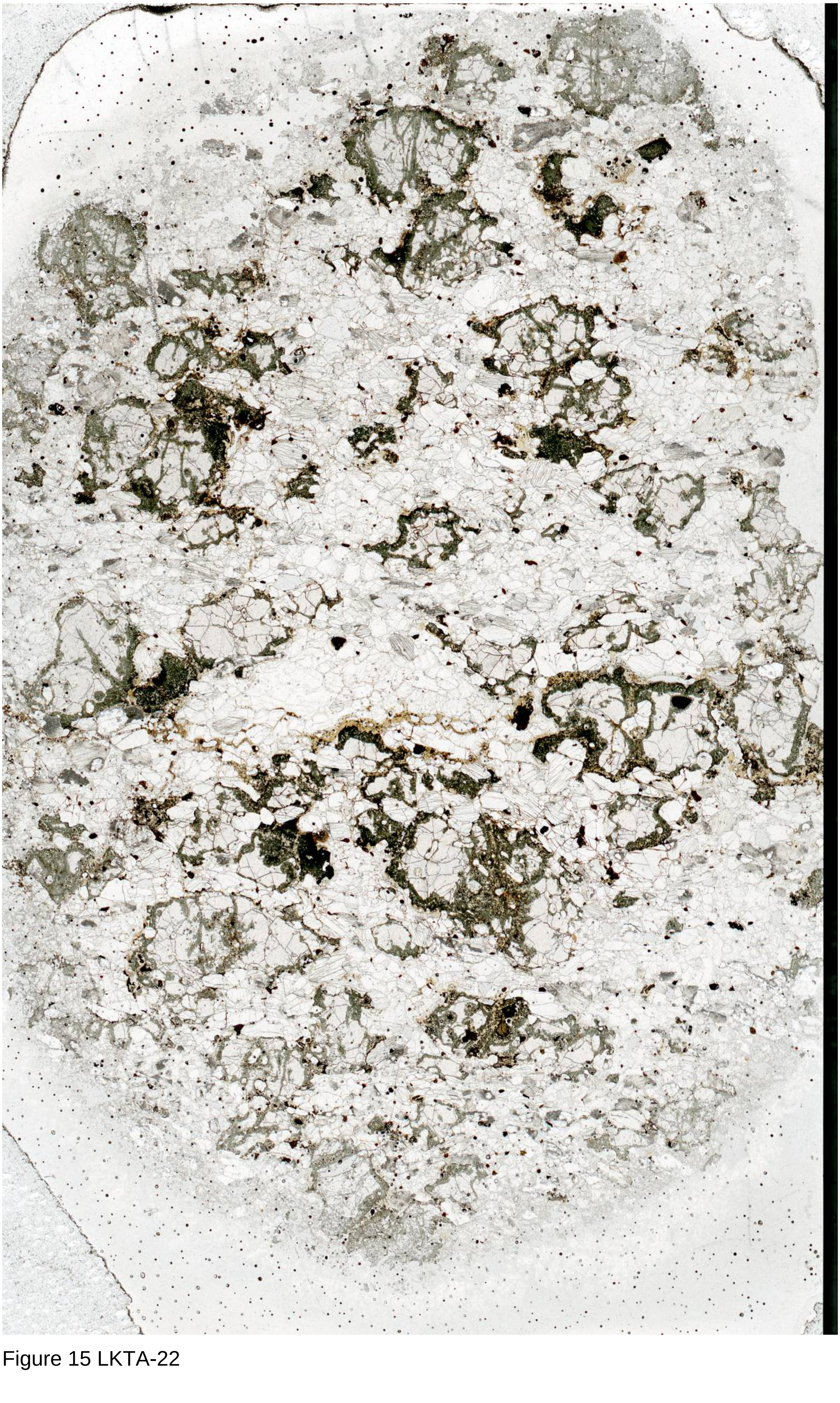


Figure 15 LKTA-22

Figure 16 BG-2C

Figure 17 TA-31

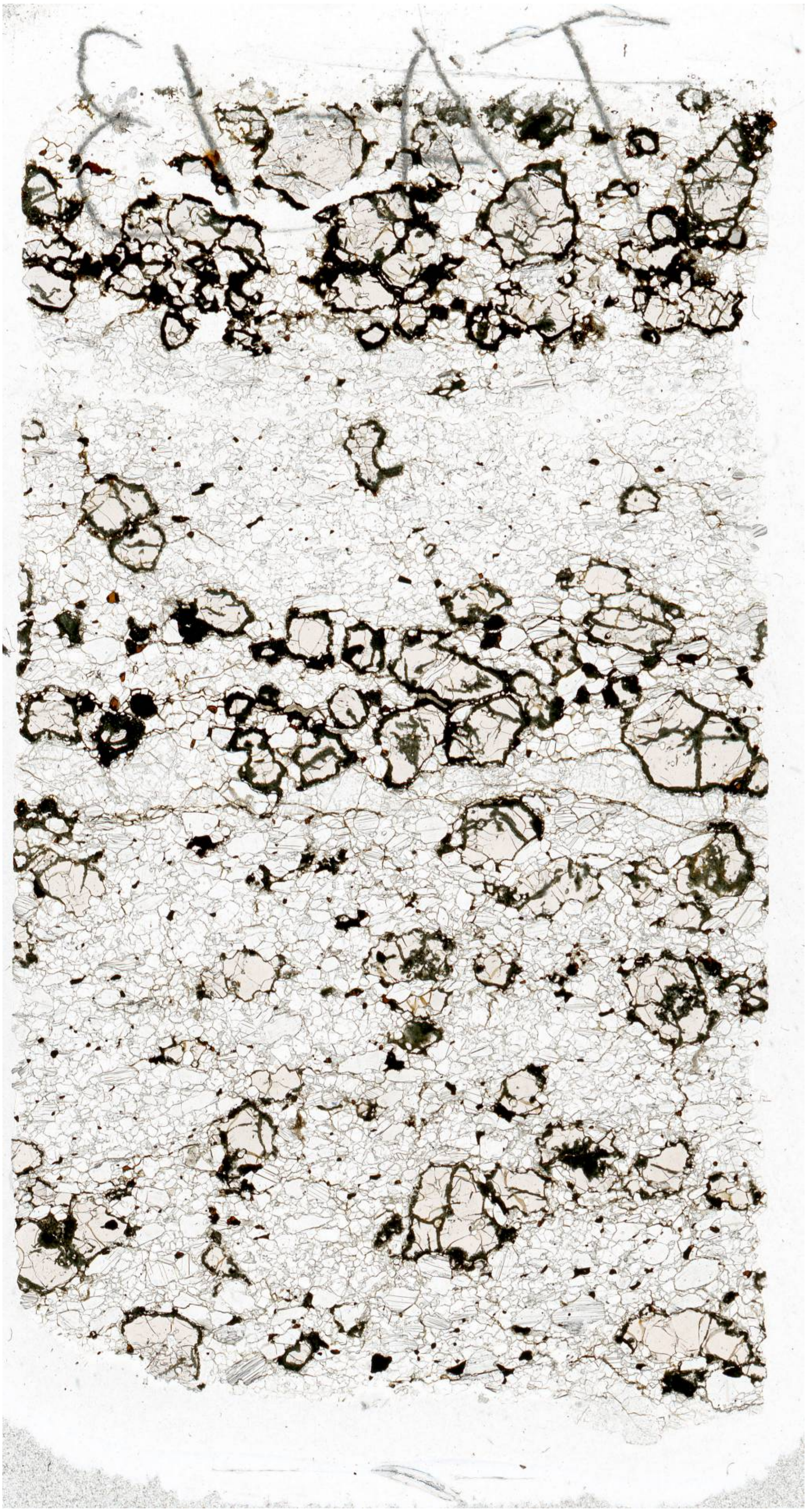


Figure 18 TA-13

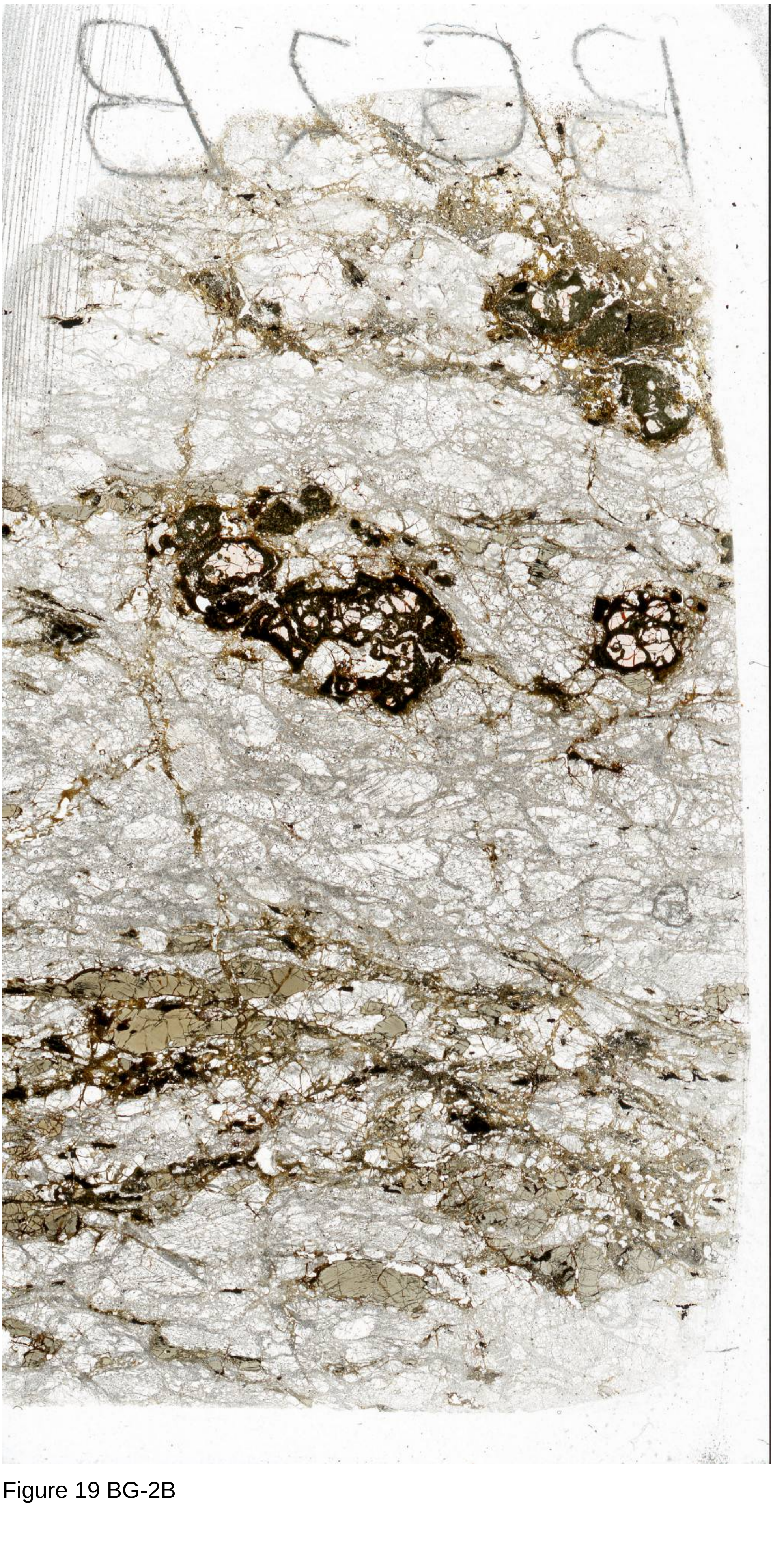


Figure 19 BG-2B

Figure 20 BG-2

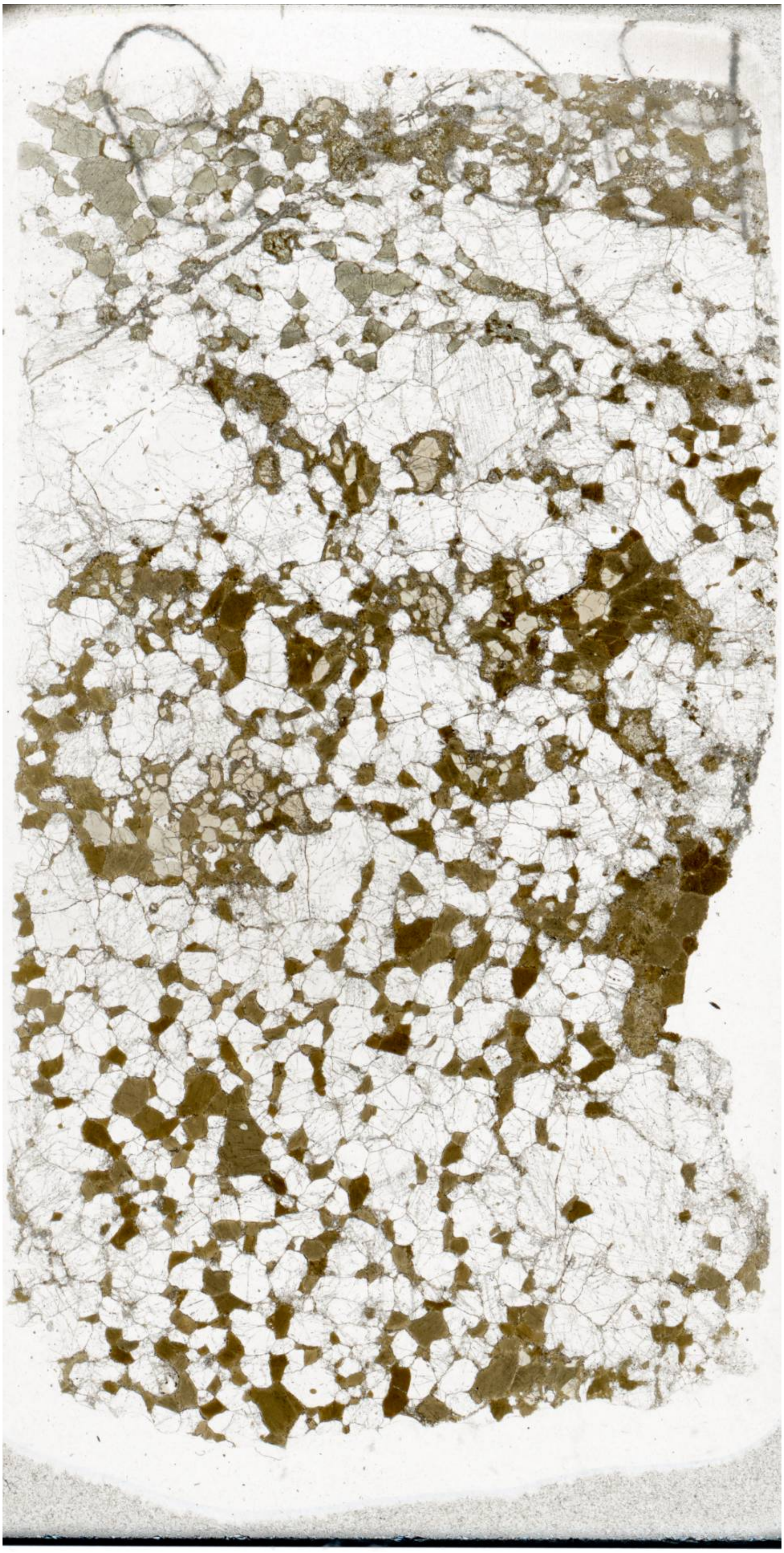


Figure 21 BG-8

Figure 22 BG-32

Figure 23 BG-12

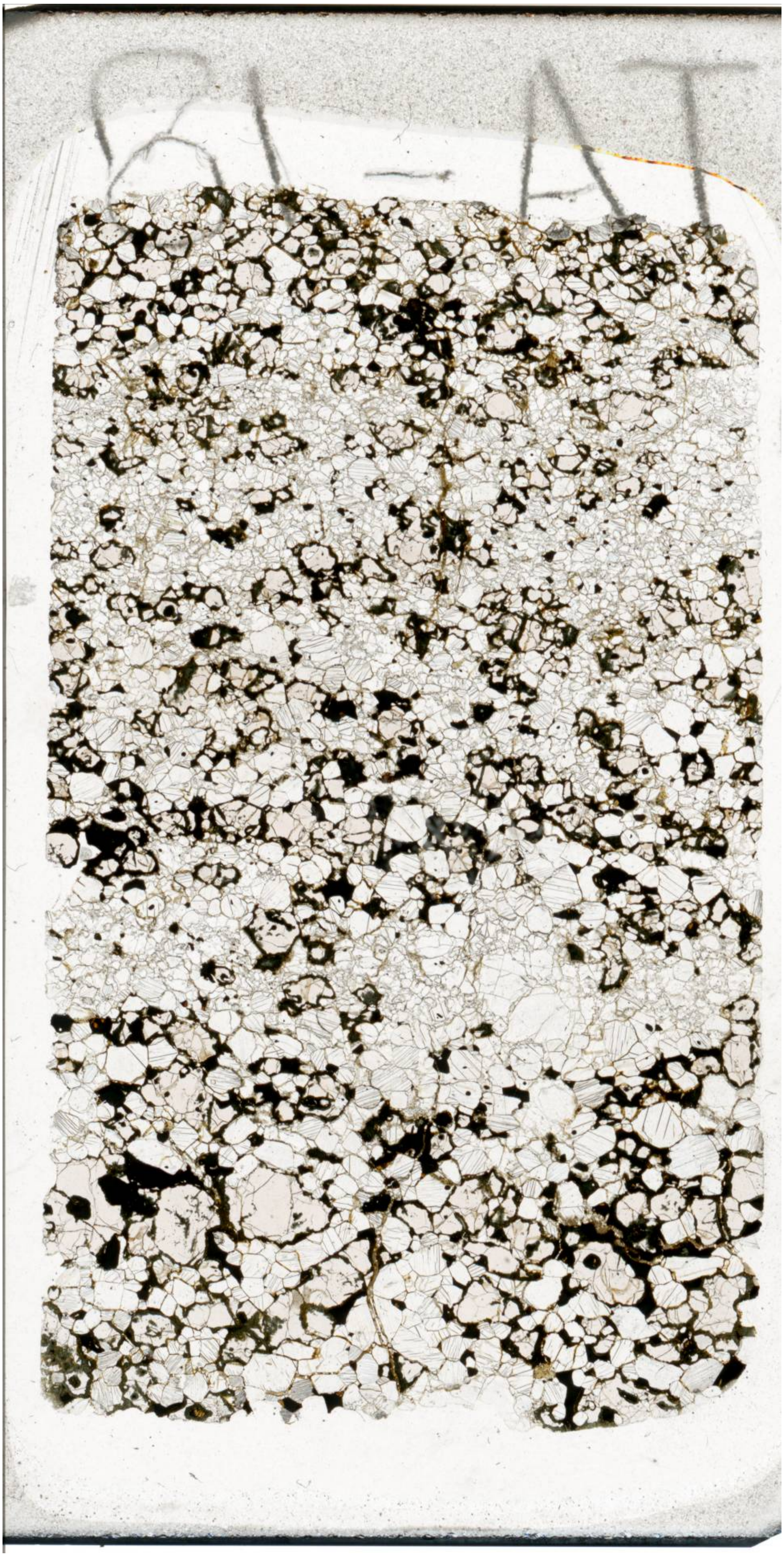


Figure 24 TA-18

Figure 25 TA-10

Figure 26 BG-4

Figure 27 BG-33

Figure 28 TA-16

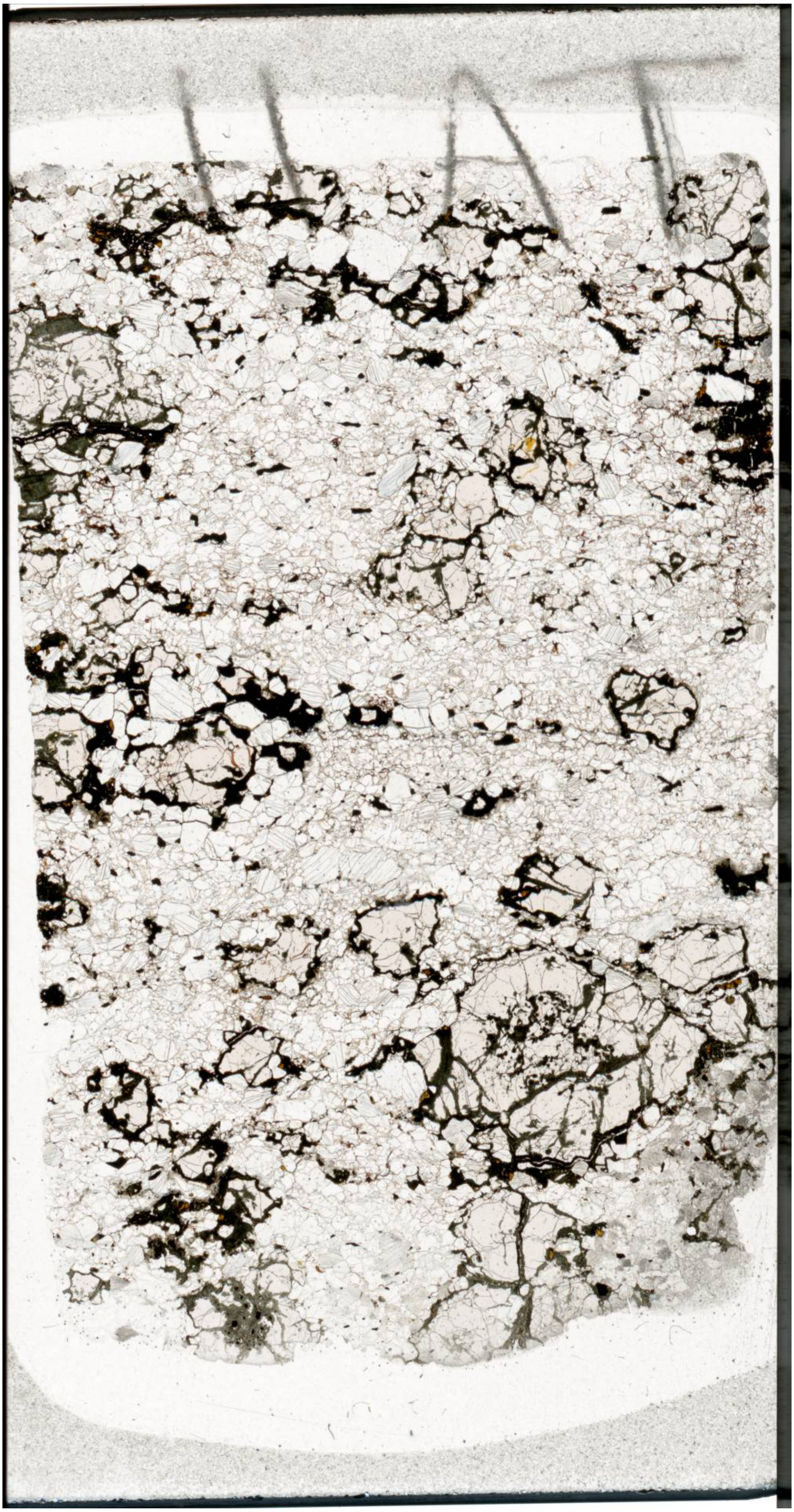


Figure 29 TA-11

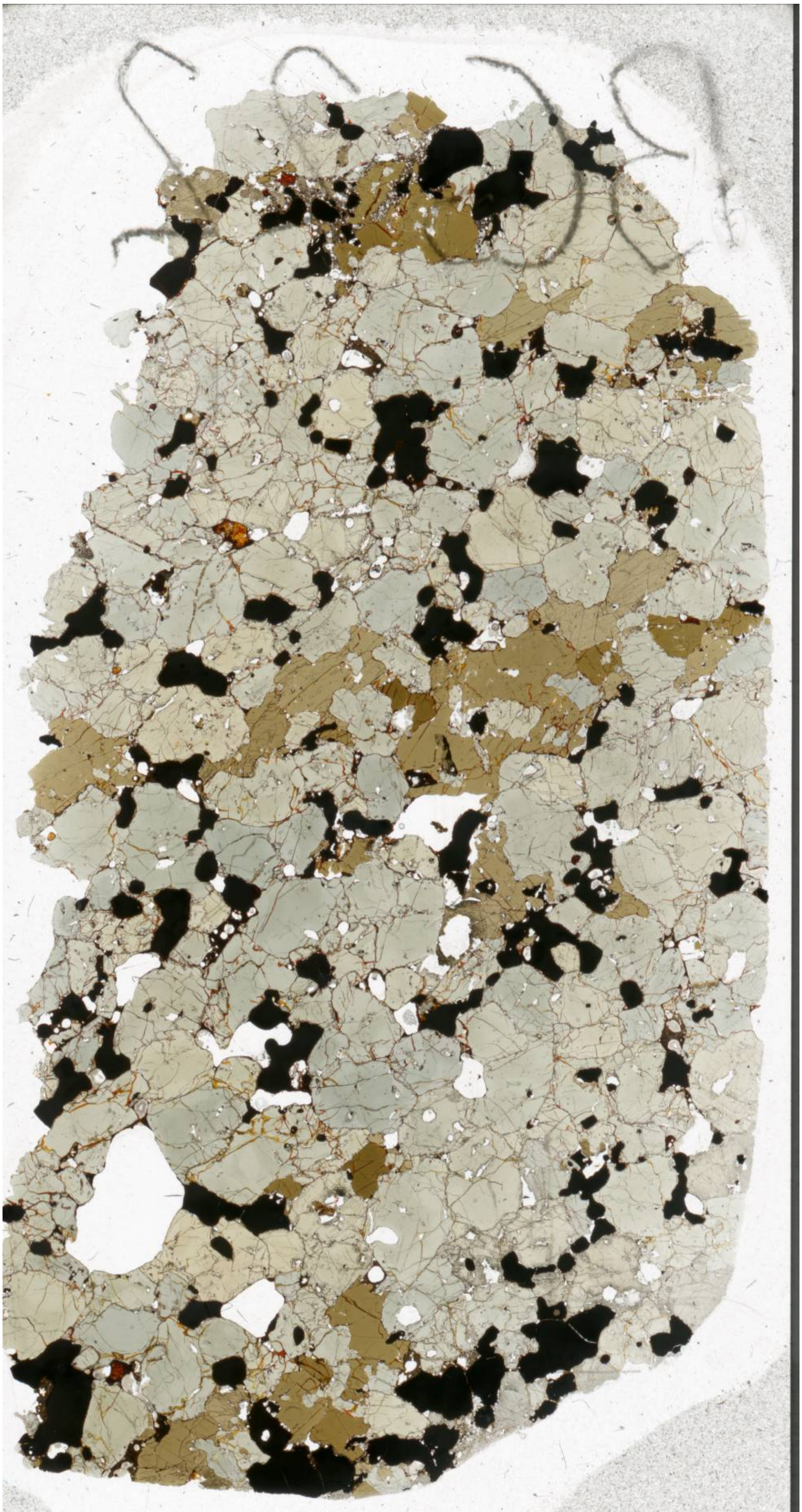
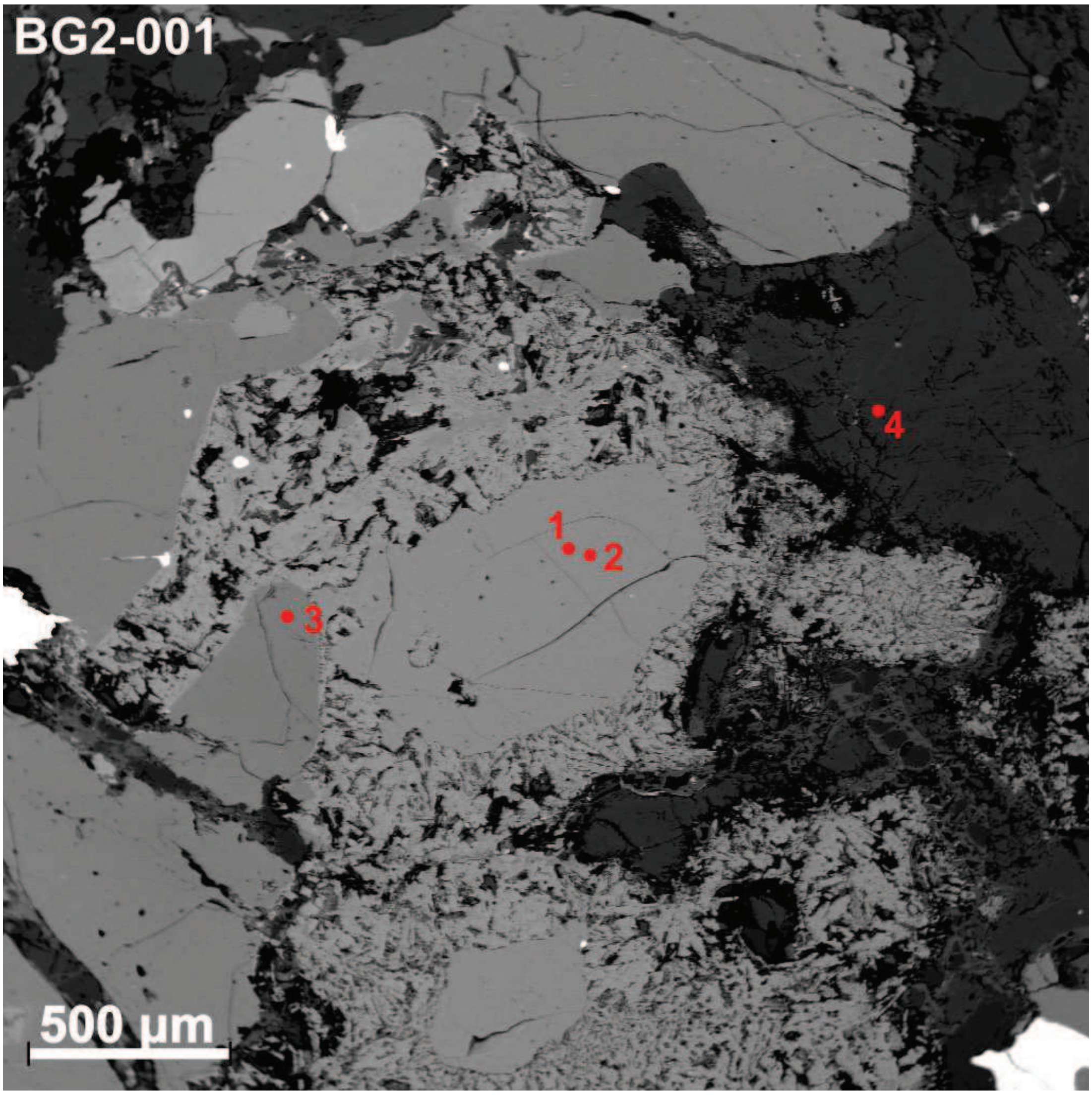
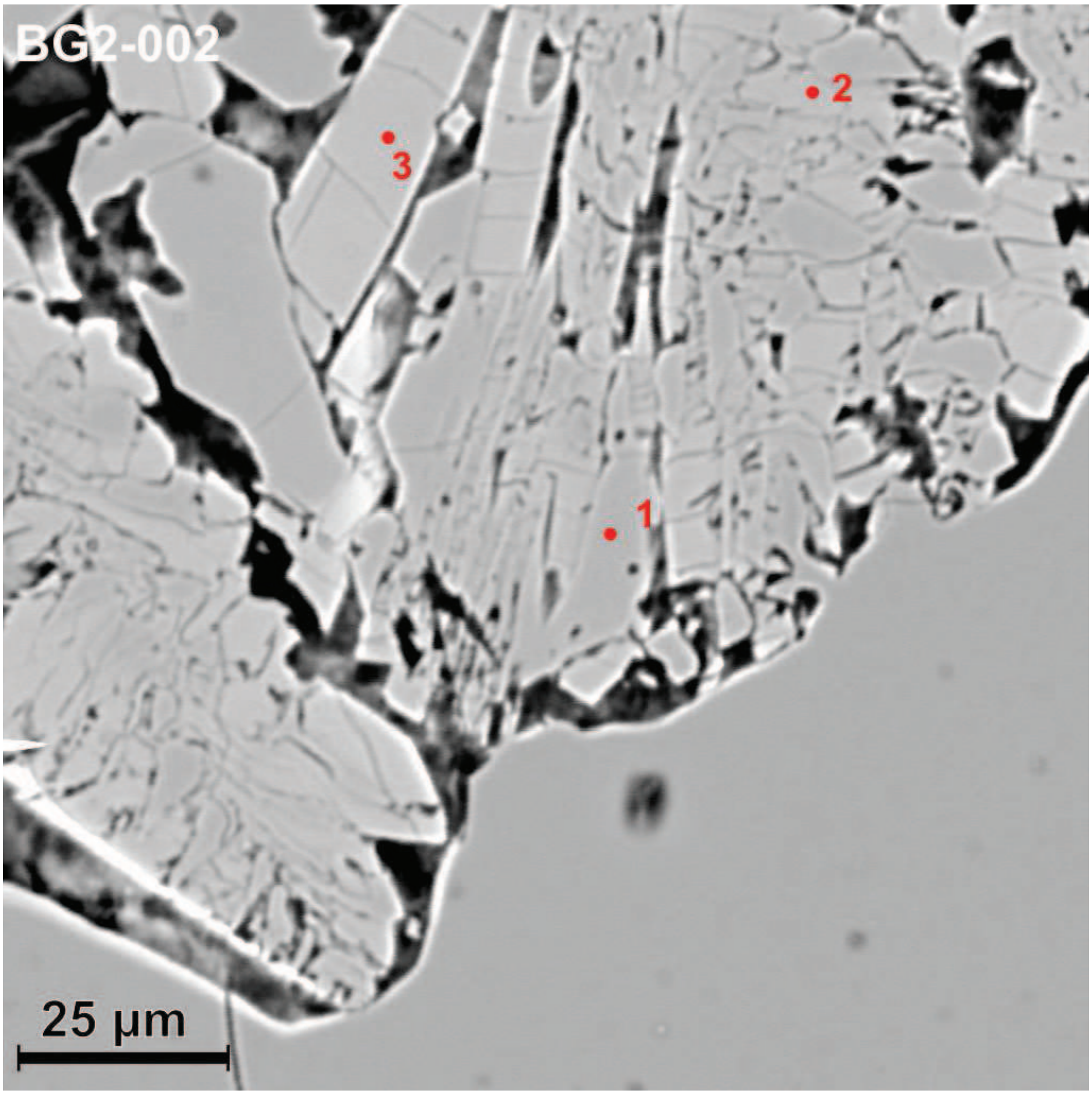
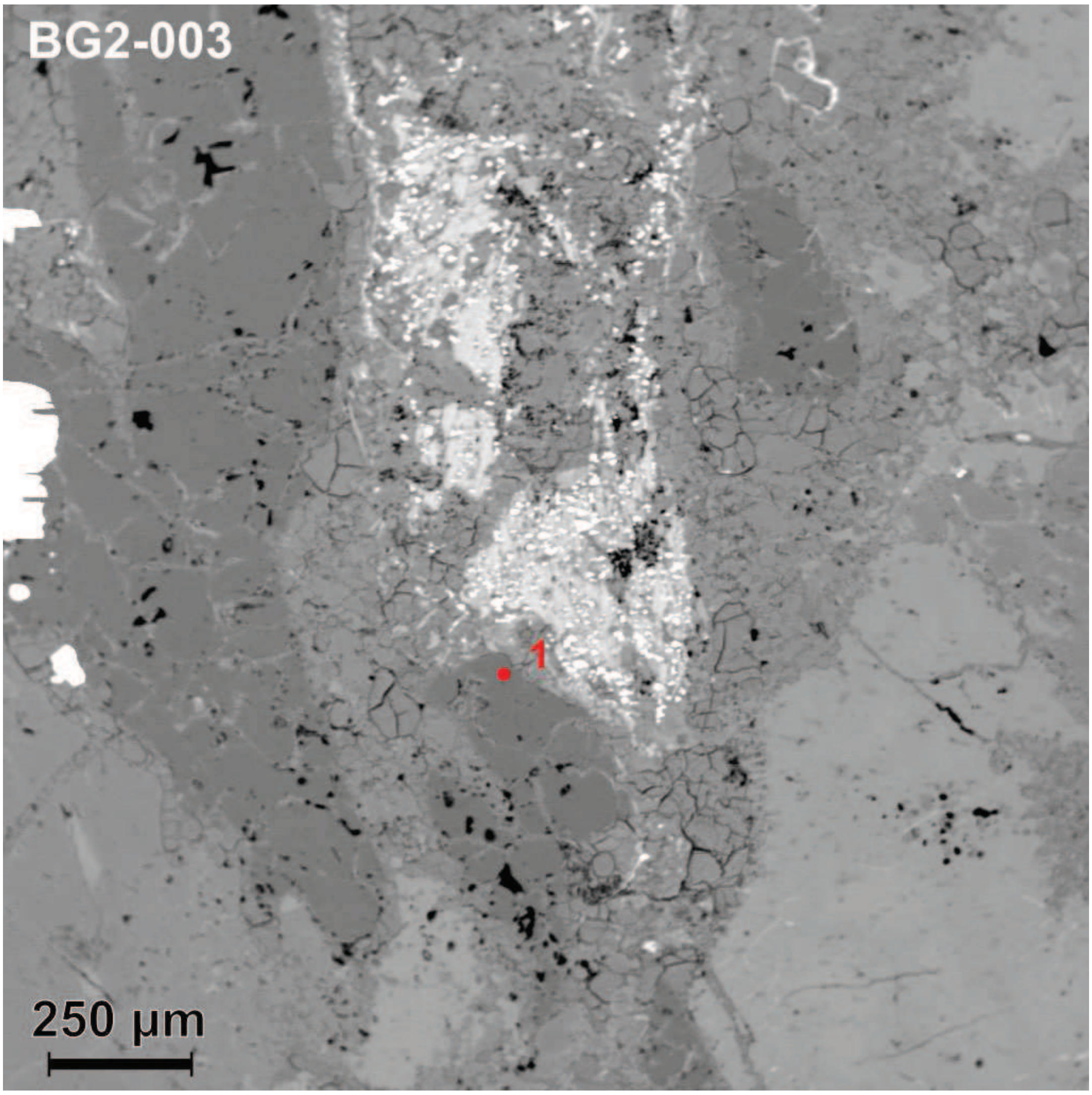


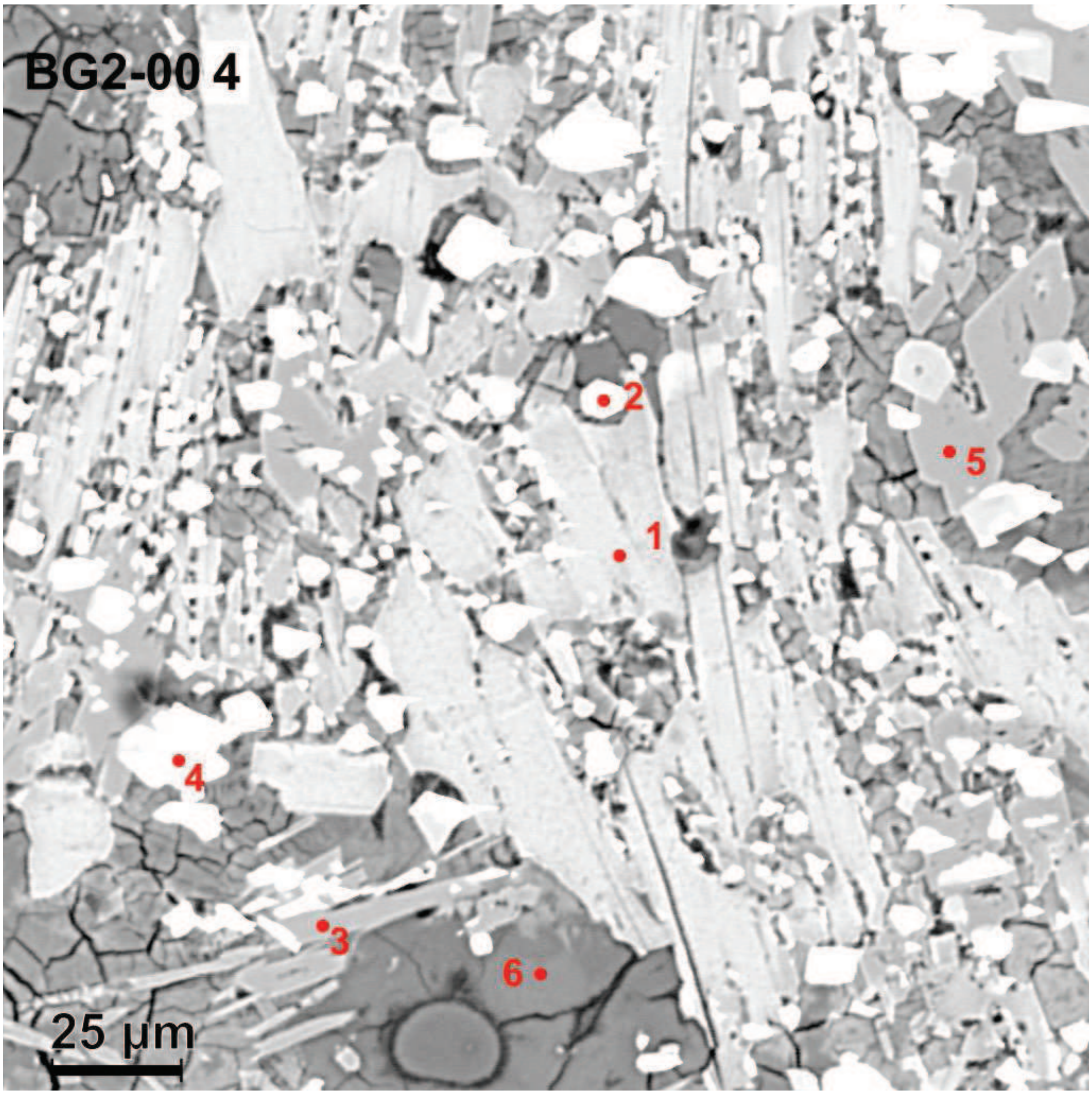
Figure 30 BG-22


BG2-001
1
2
3
4
500 µm

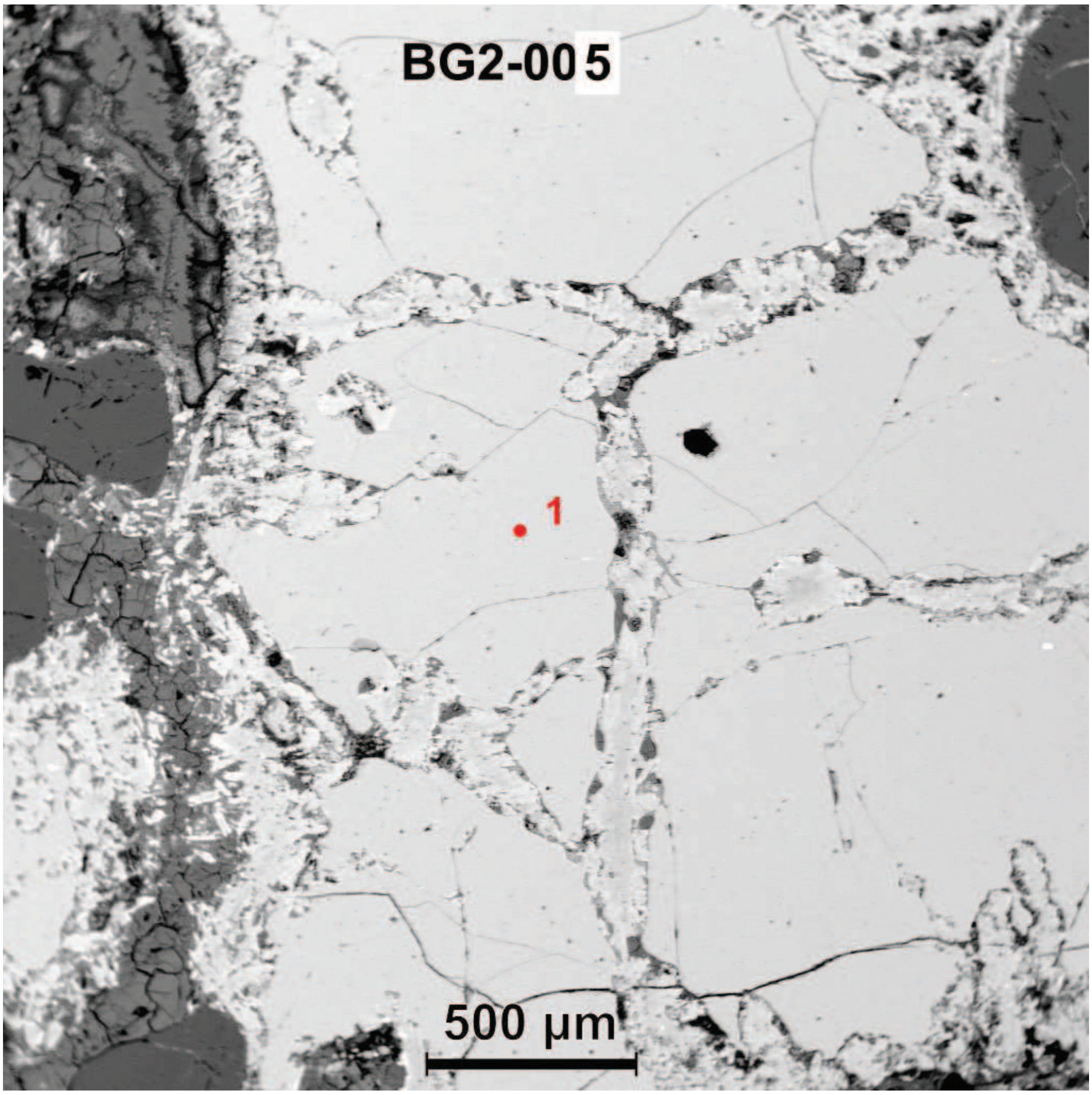

BG2-002
2
3
1
25 µm

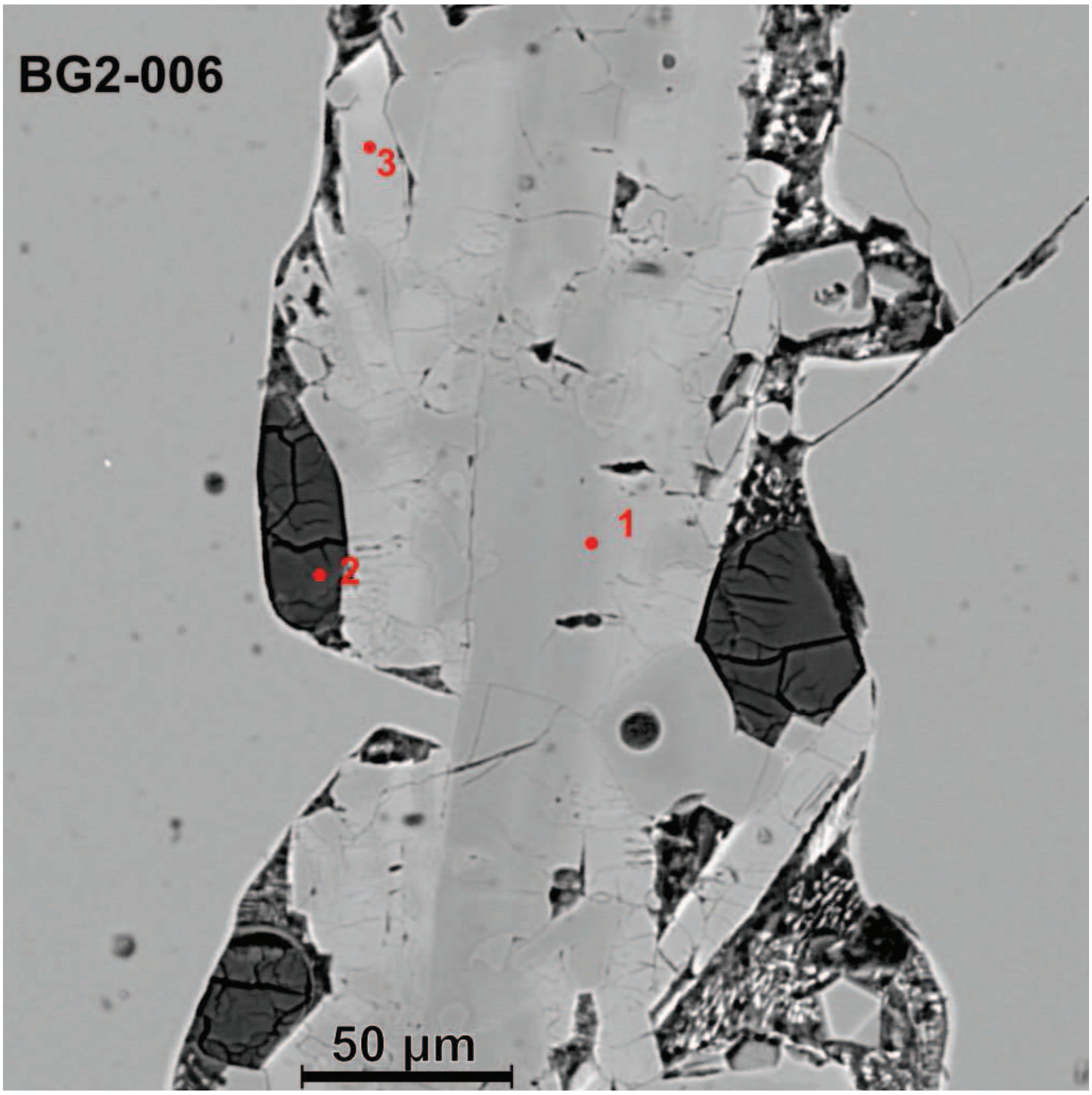


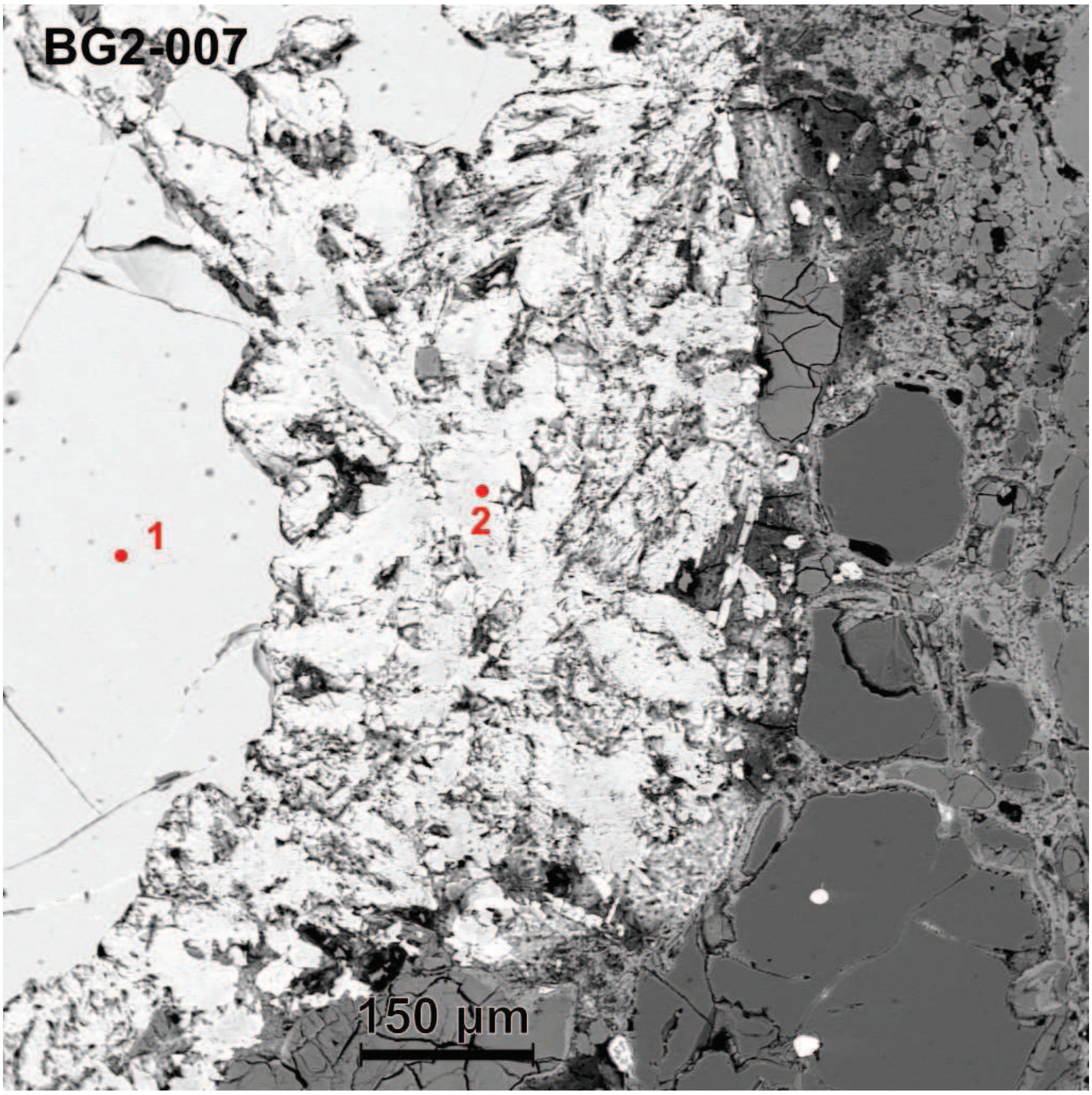
BG2-003
1
250 µm

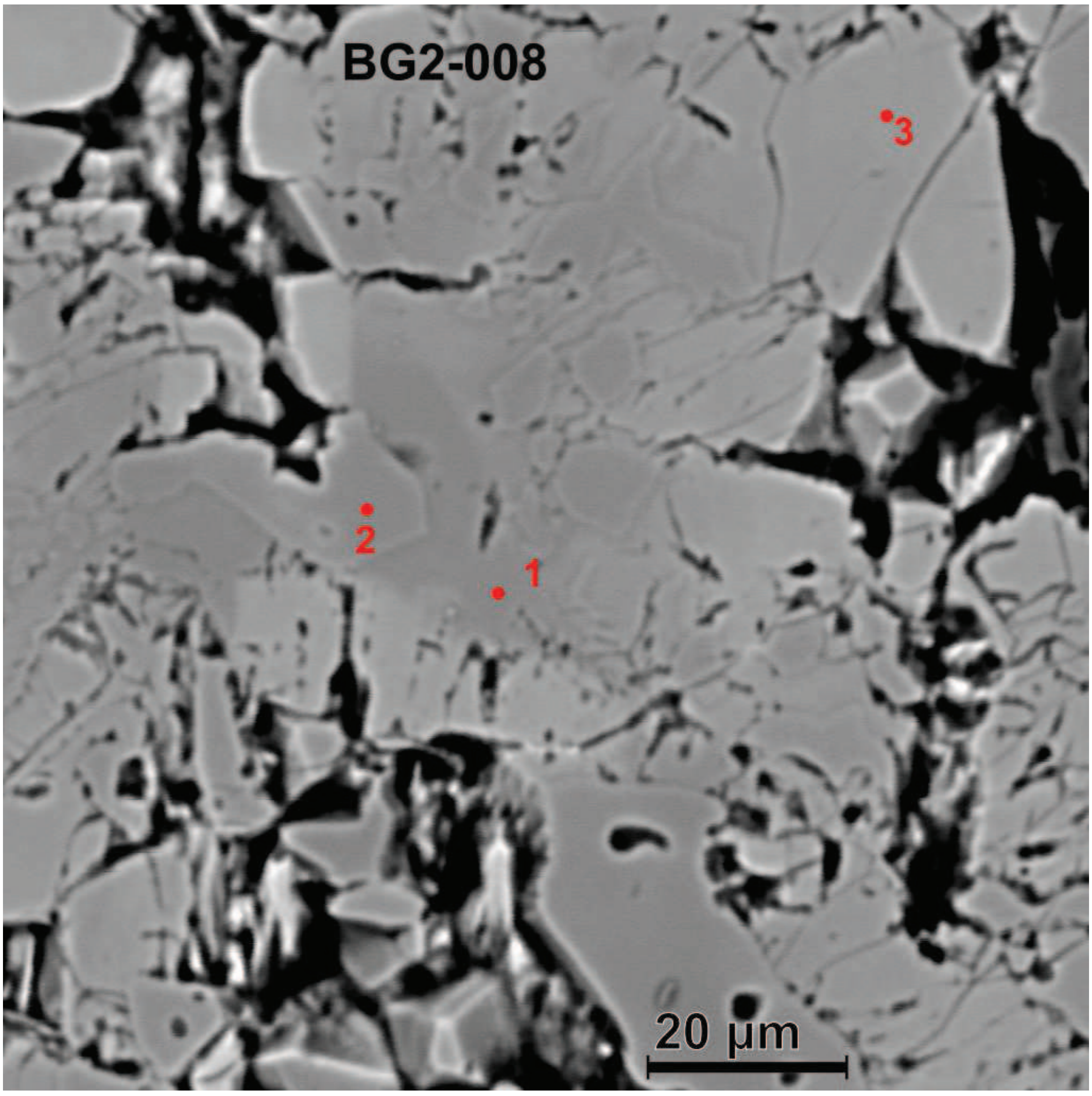


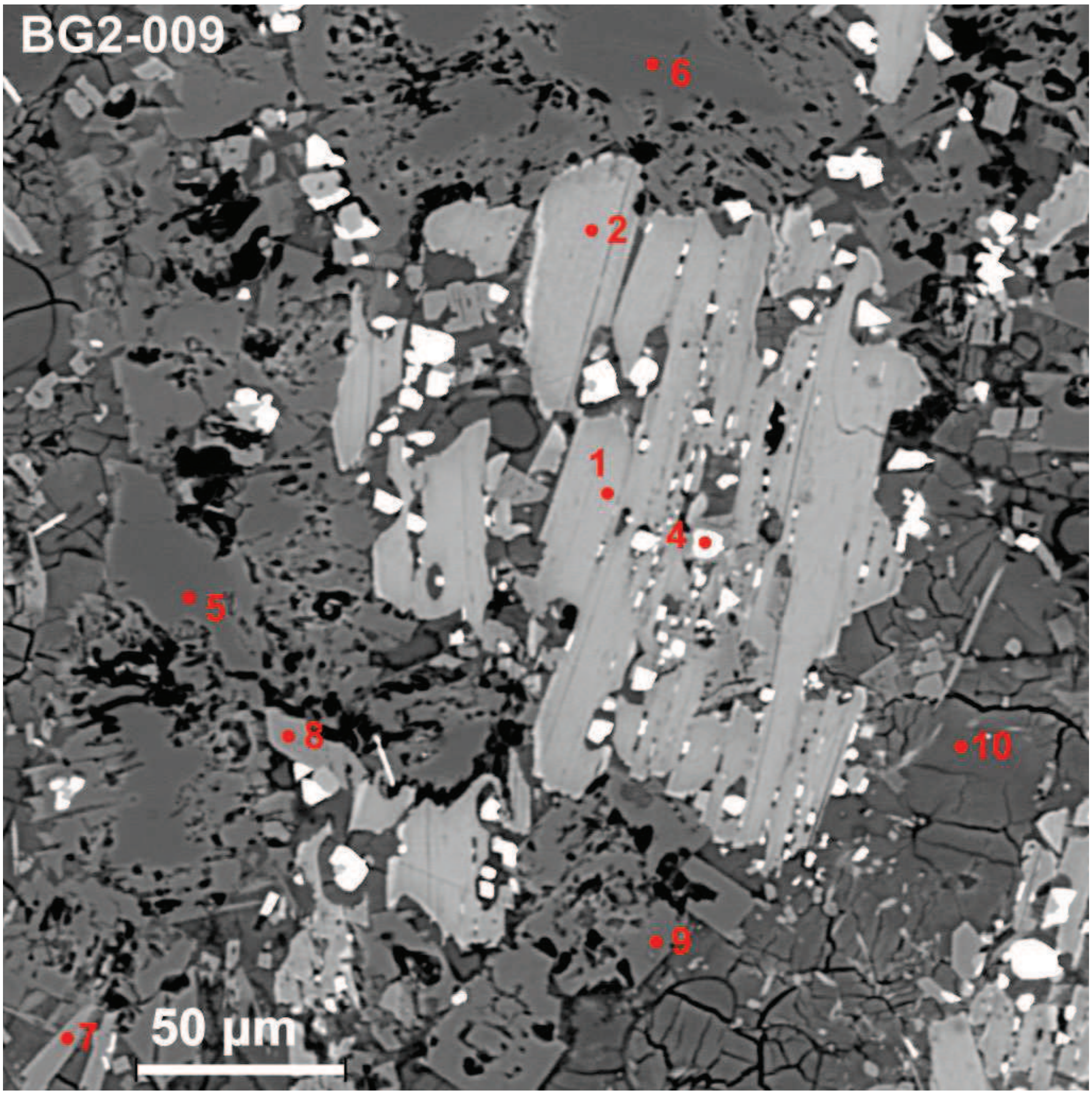
BG2-00 4
2
5
1
4
3
6
25 µm

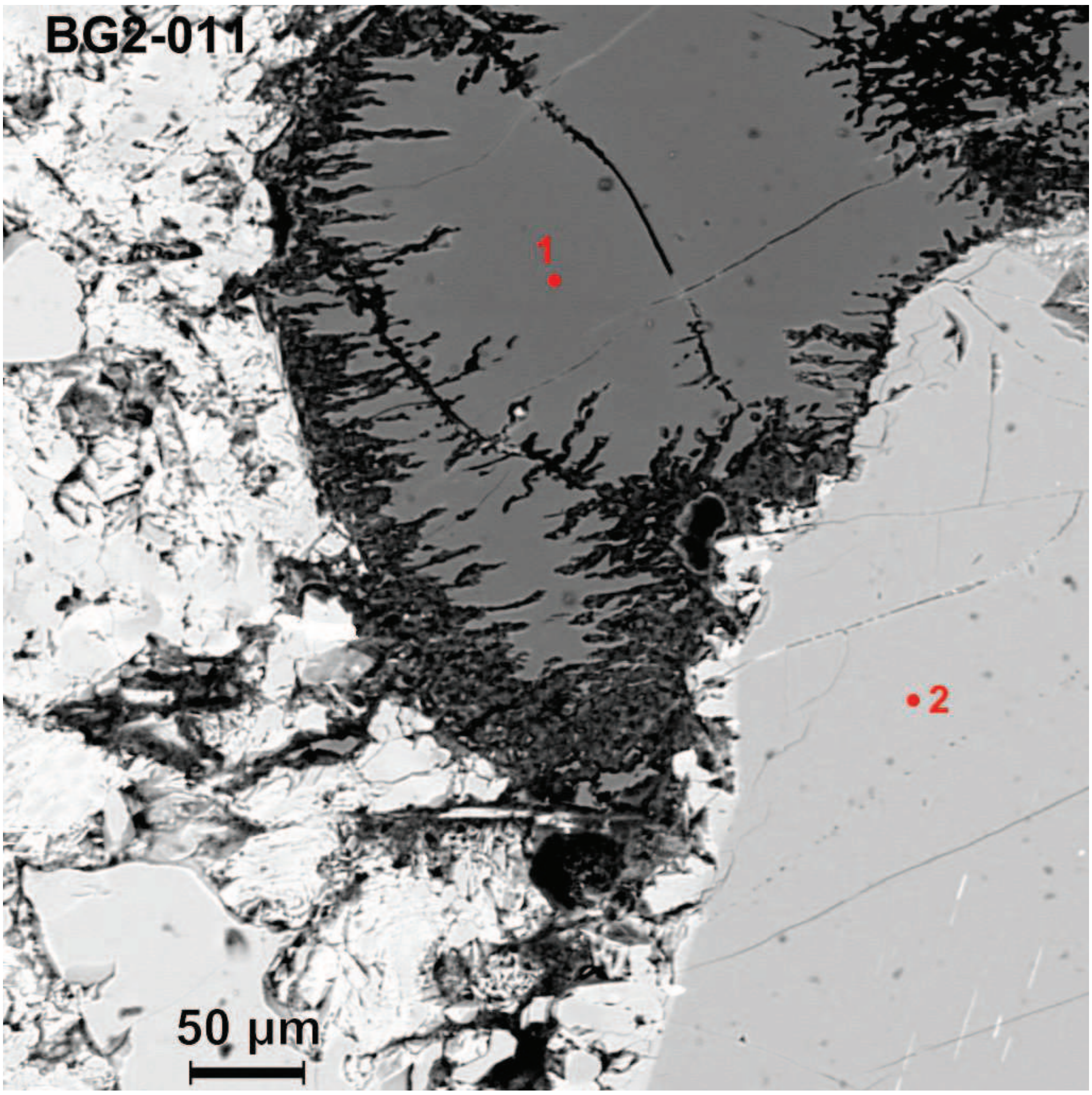

BG2-005
1
500 µm

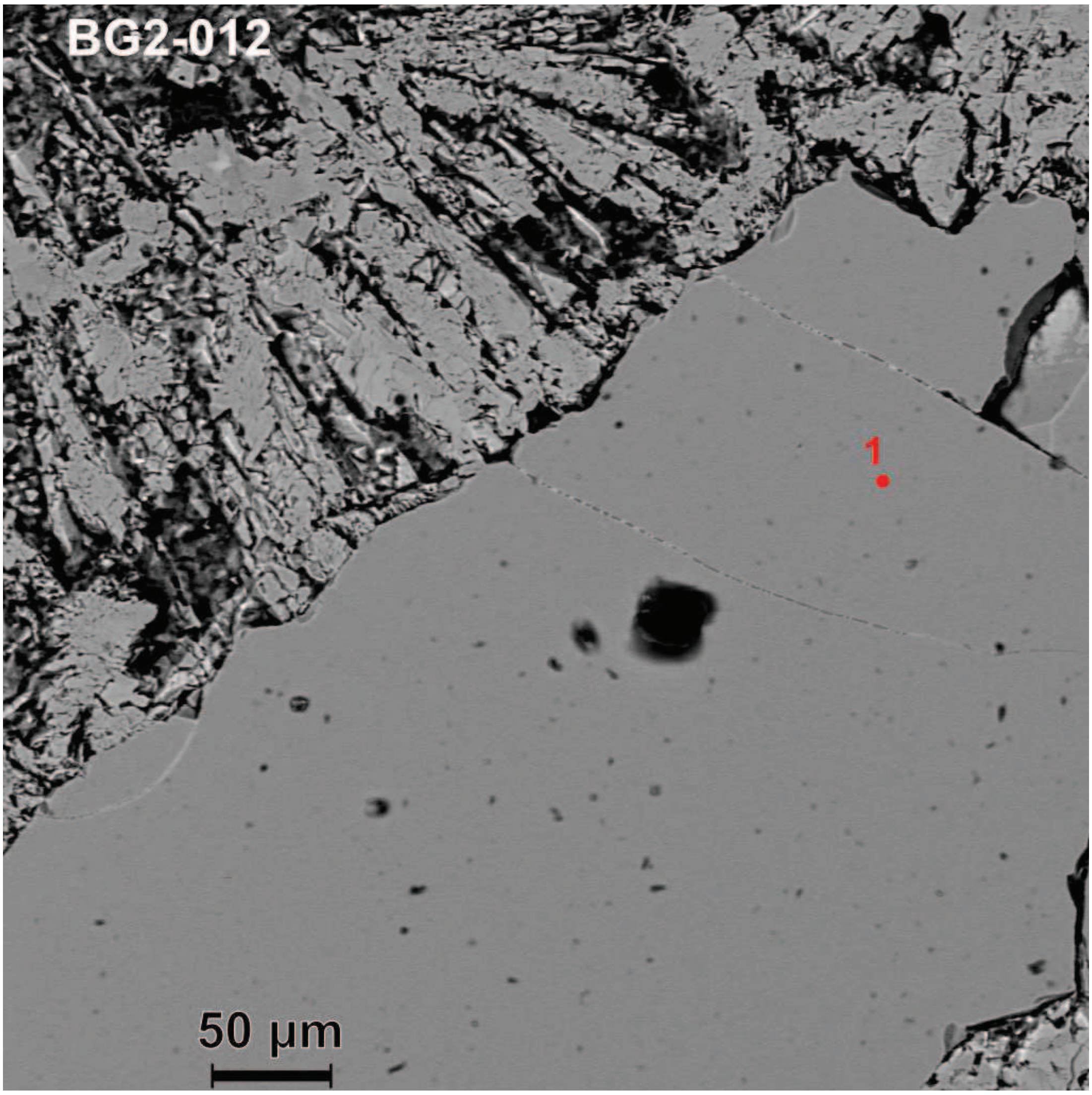

BG2-006
3
1
2
50 µm

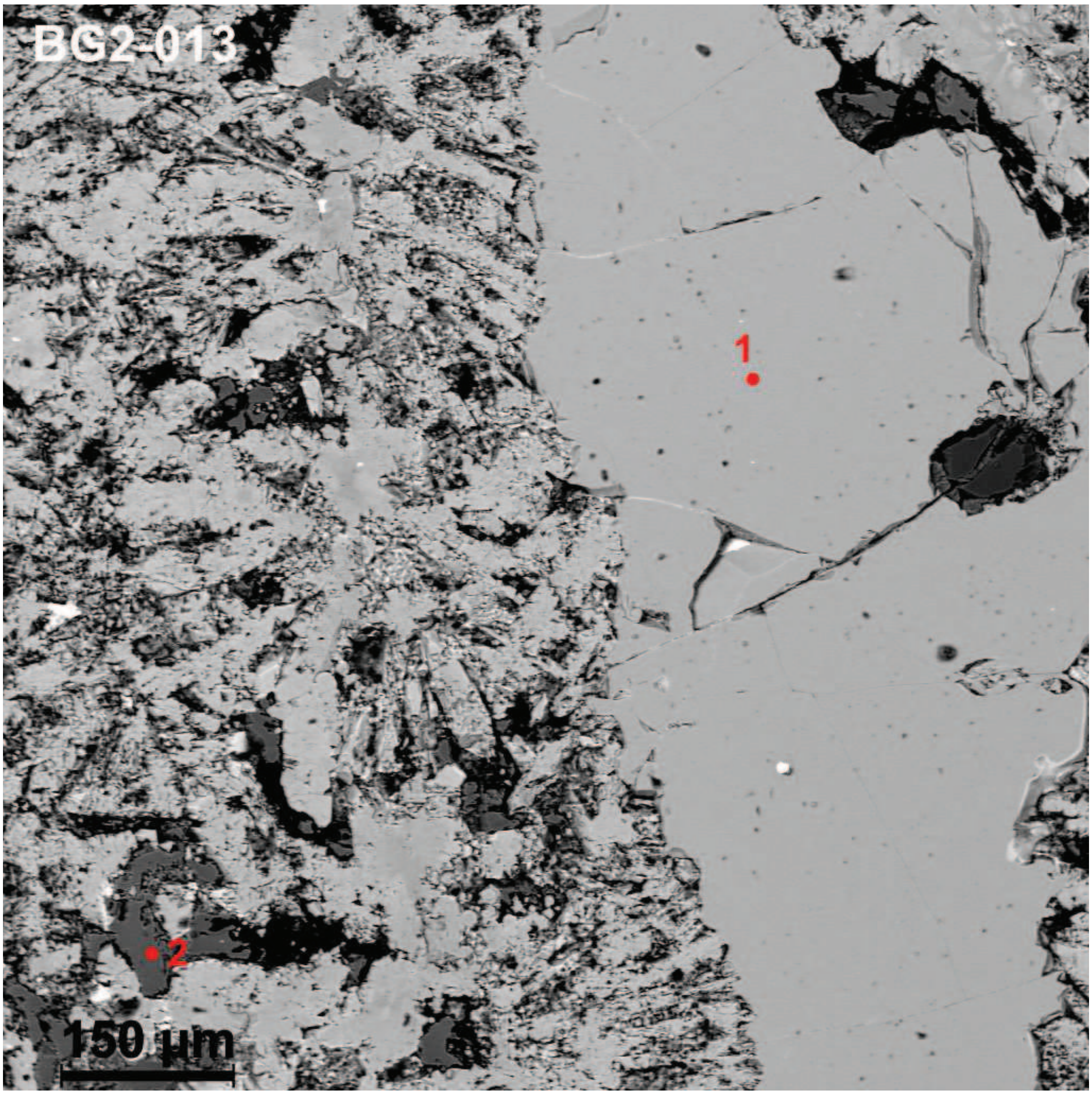

BG2-007
1
2
150 µm

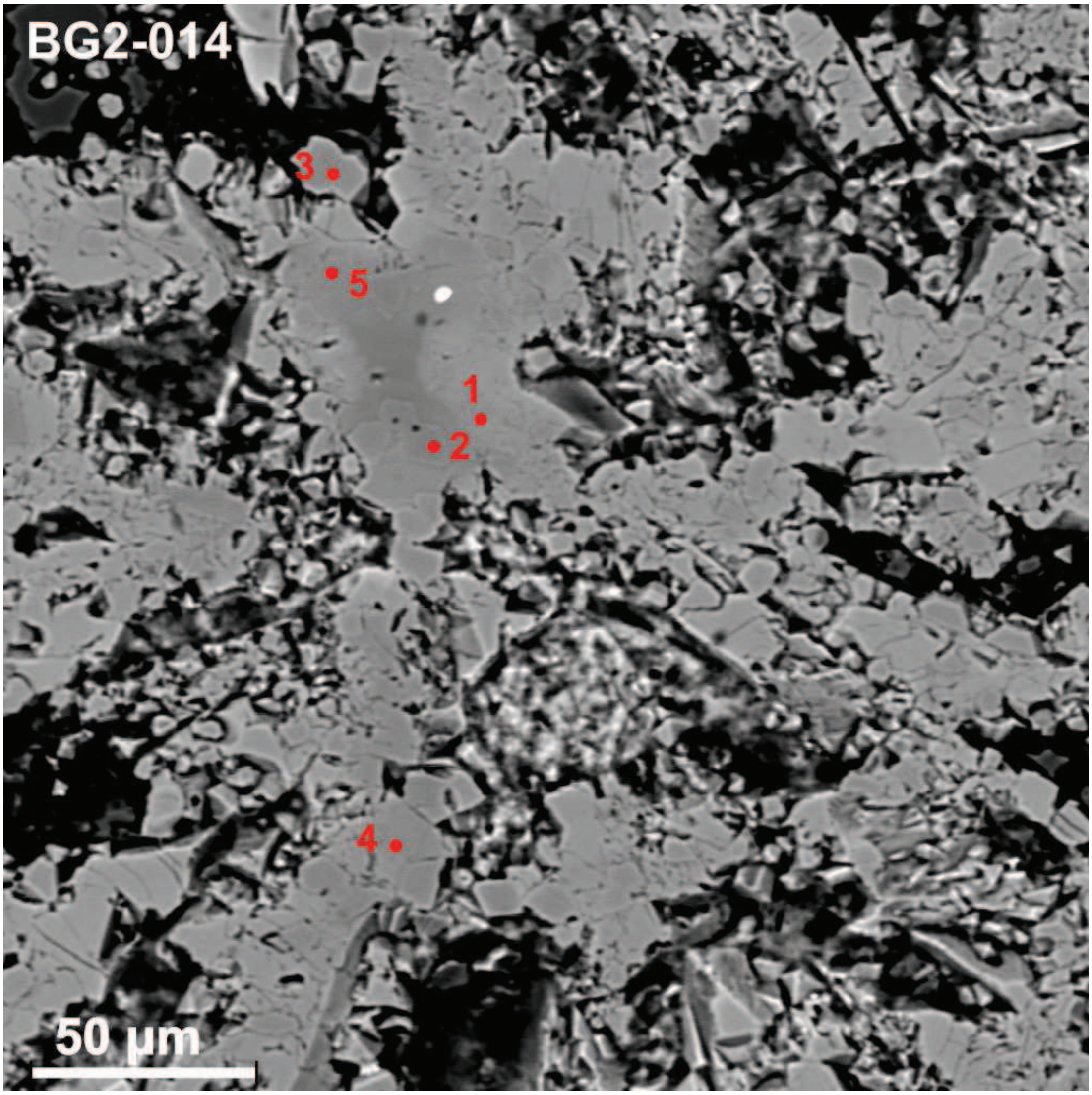

BG2-008
3
2
1
20 µm

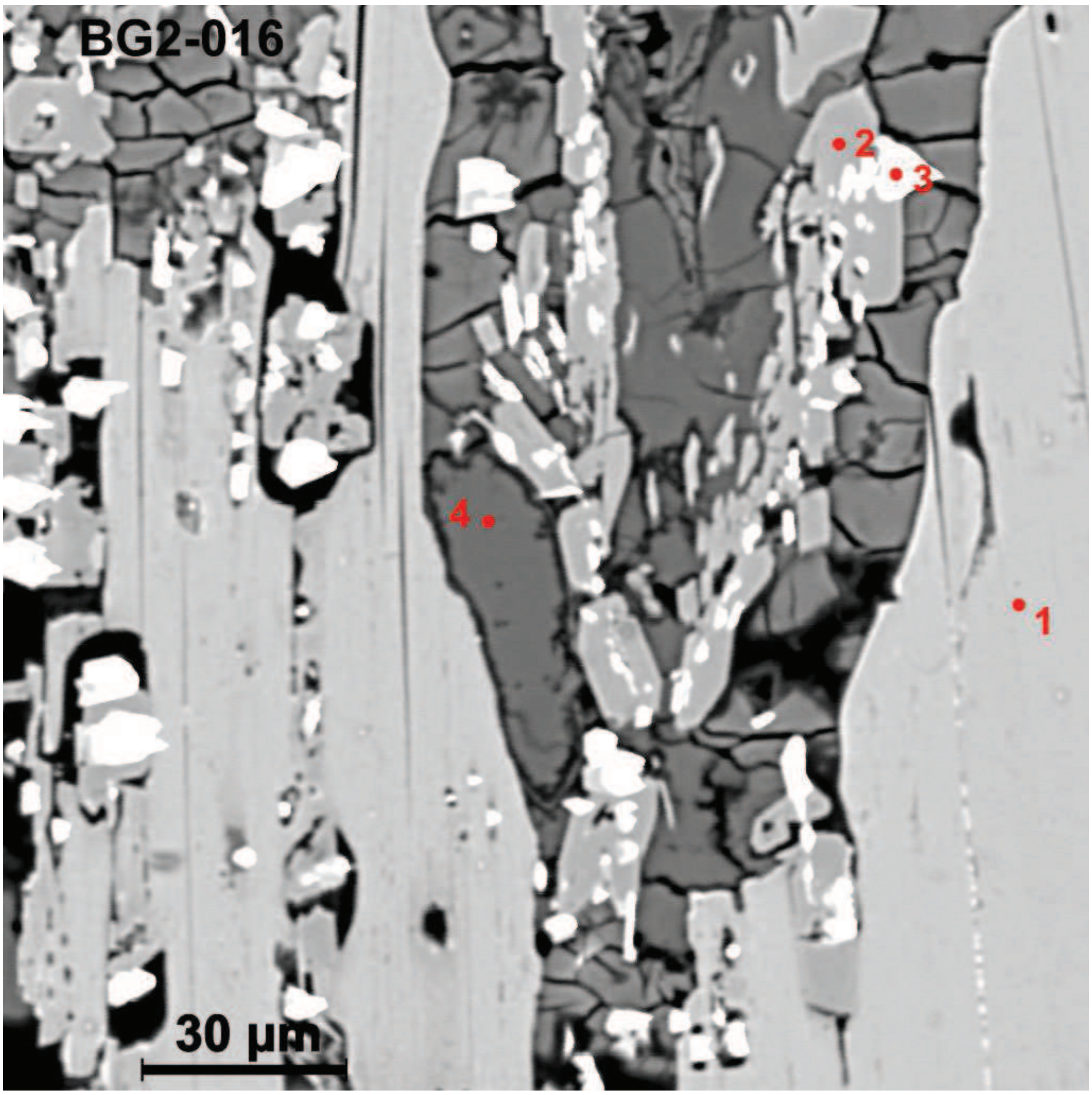

BG2-009
6
2
1
4
5
8
10
9
7
50 µm

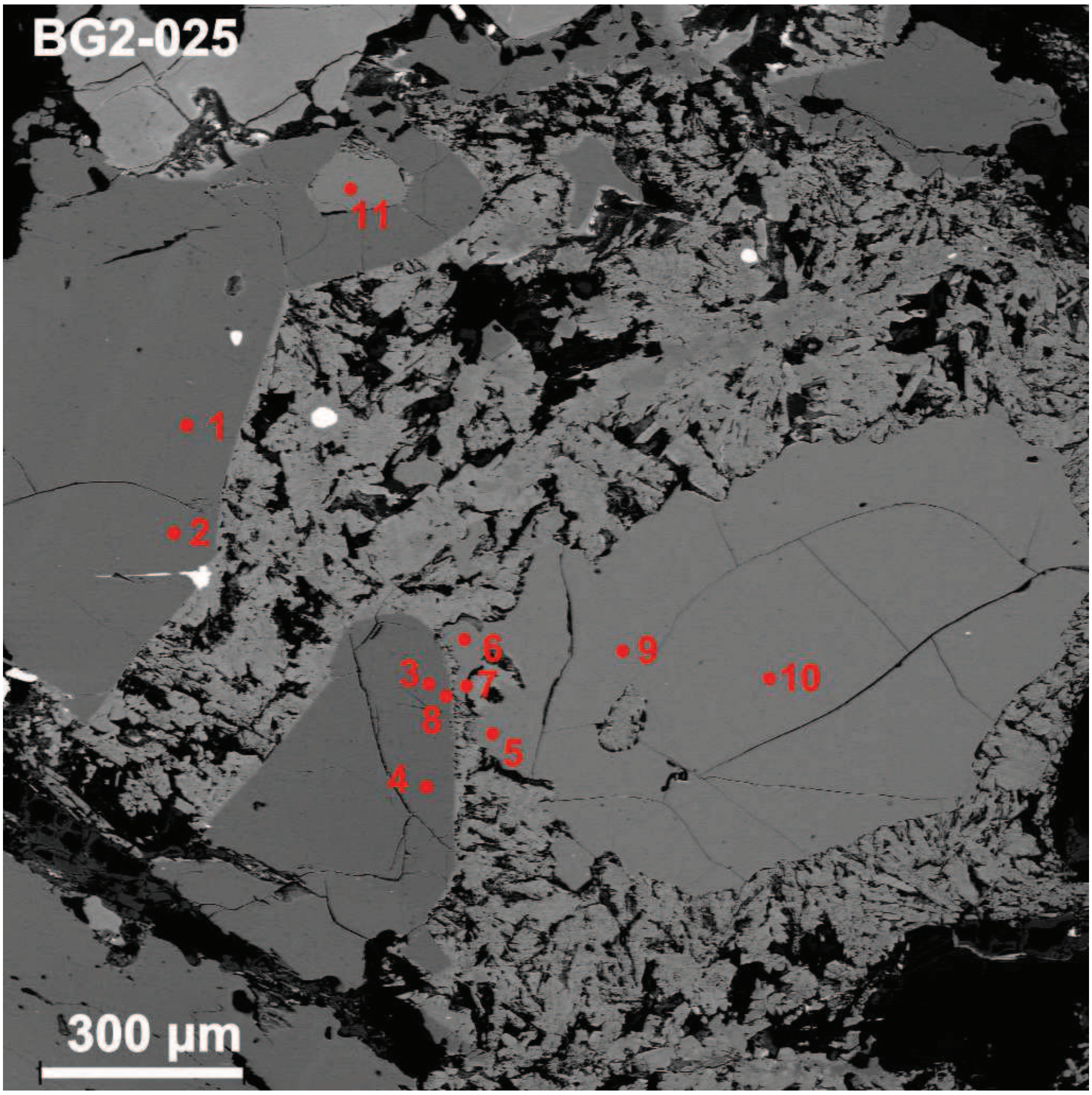

BG2-011
1
2
50 µm

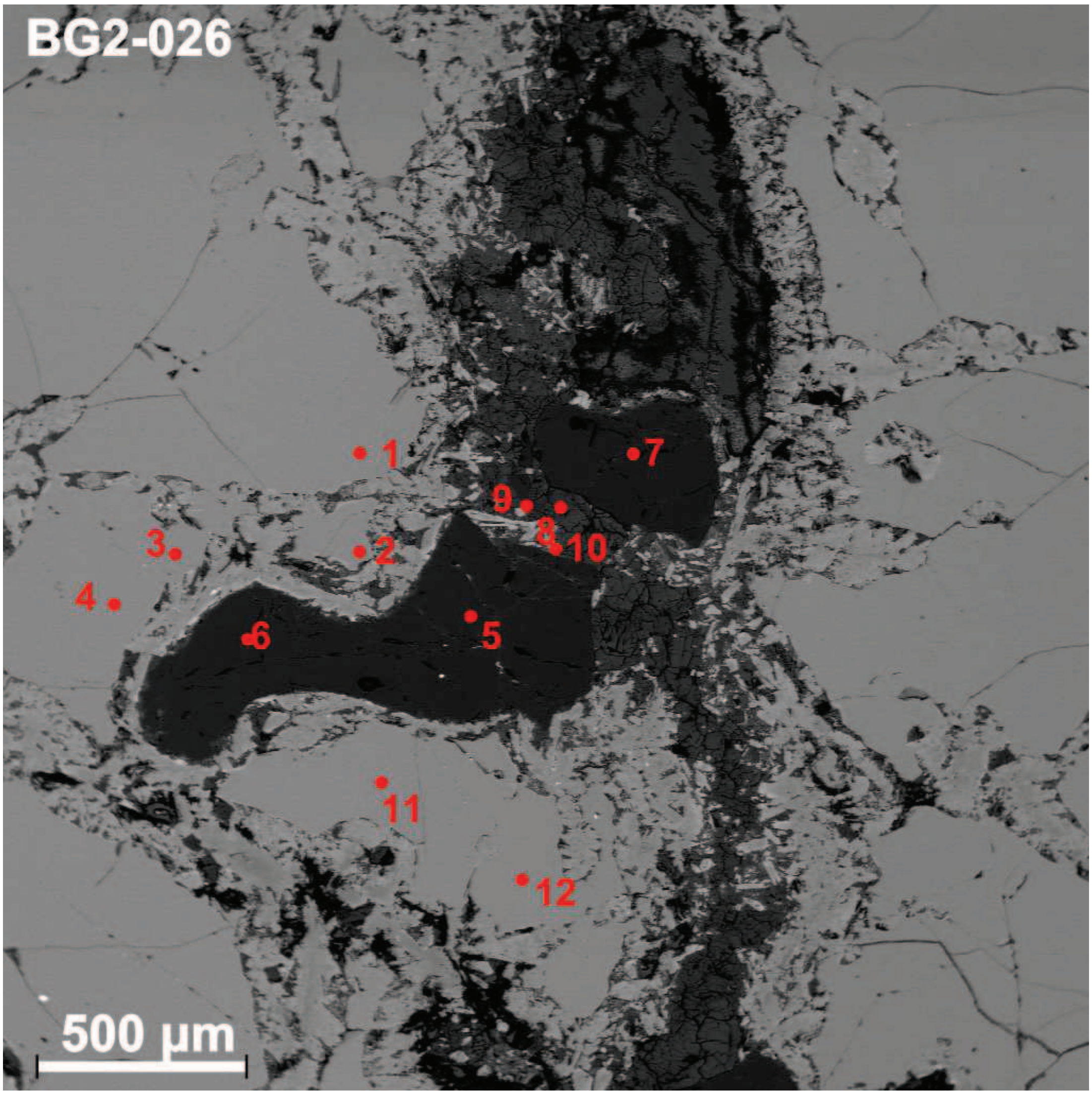

BG2-012
1
50 µm

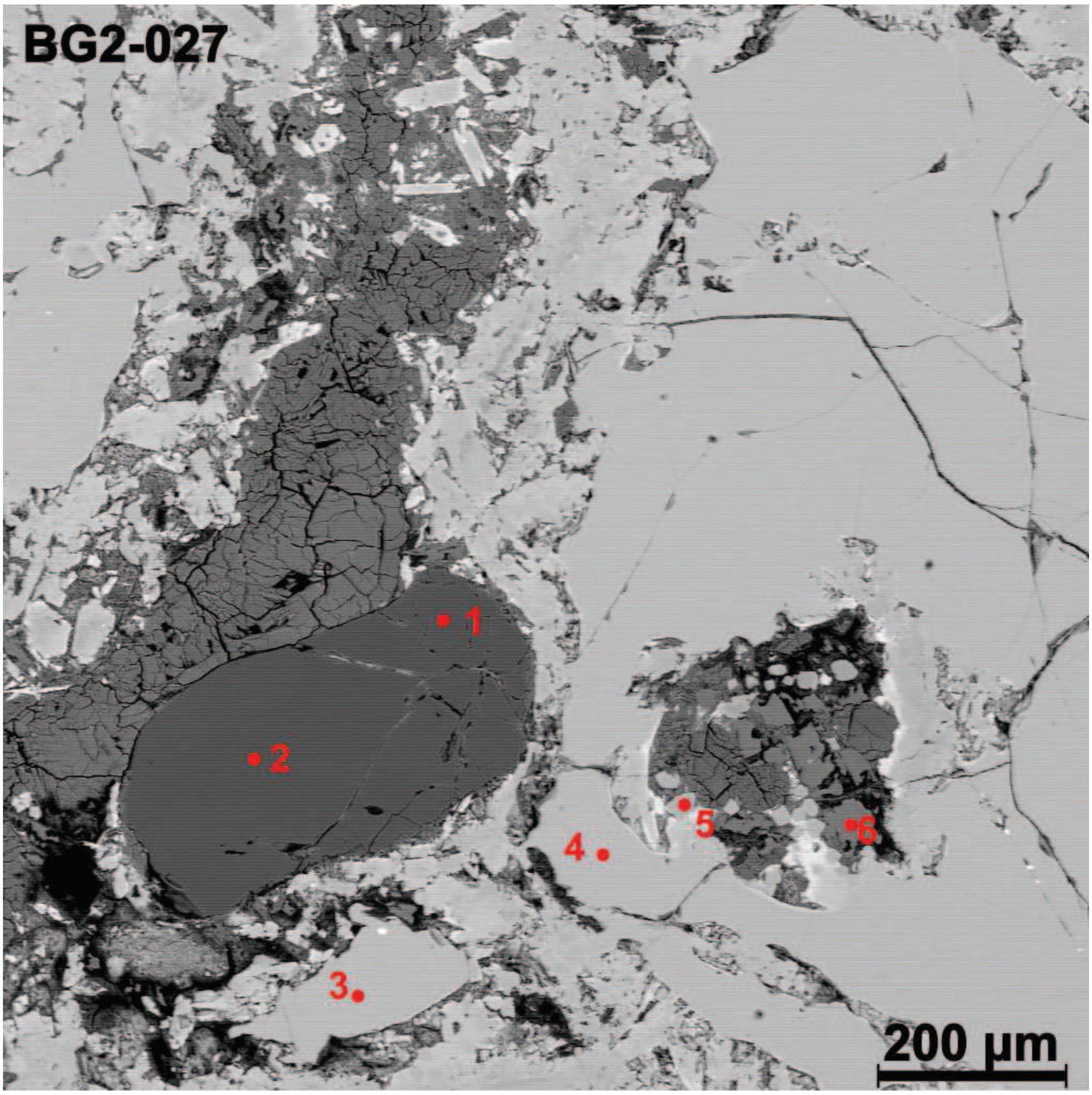

BG2-013
1
2
150 µm

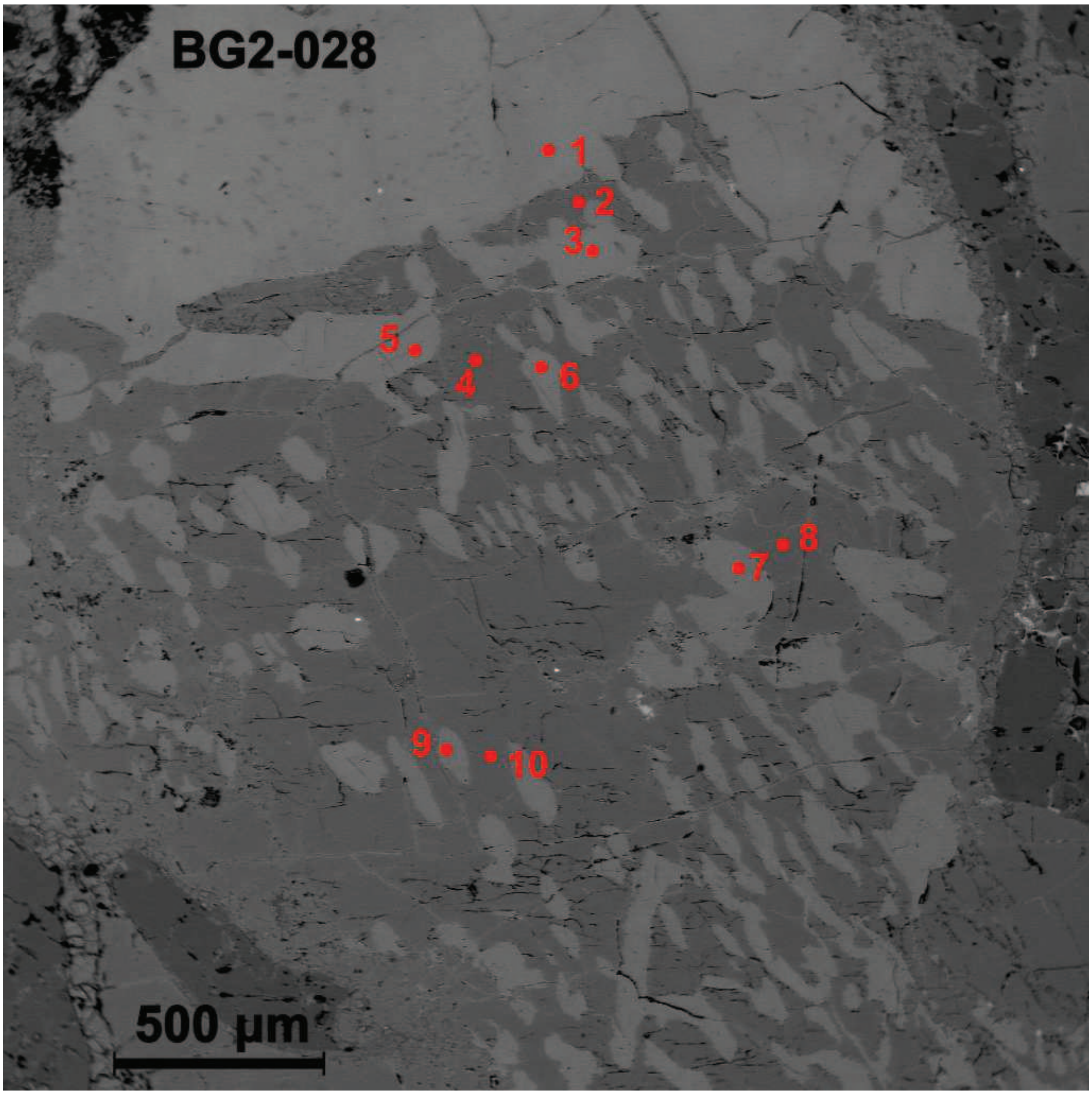

BG2-014
3
5
1
2
4
50 µm

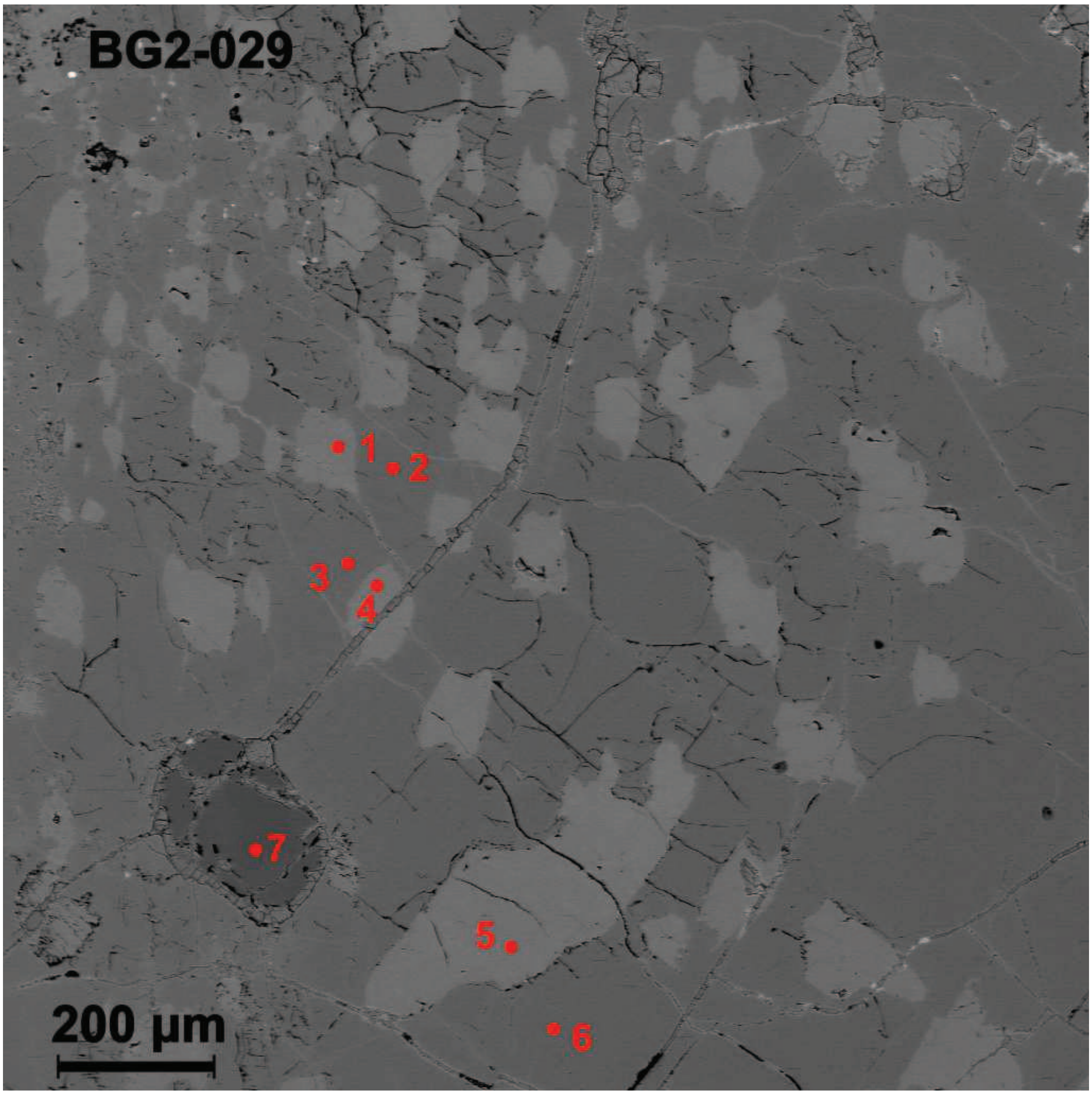

BG2-016
2
3
4
1
30 µm

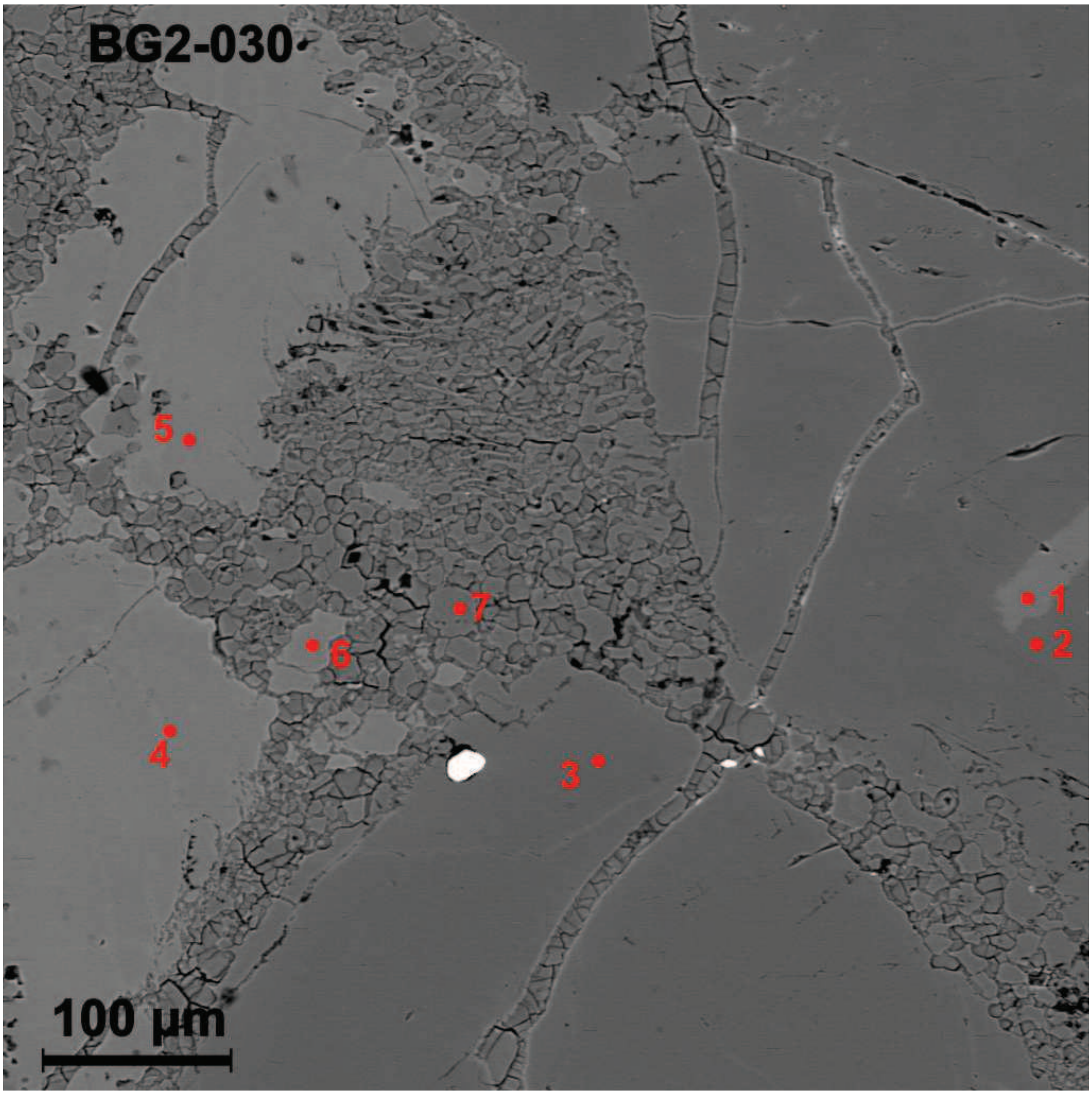

BG2-025
11
1
2
6
3
7
8
9
10
5
4
300 µm

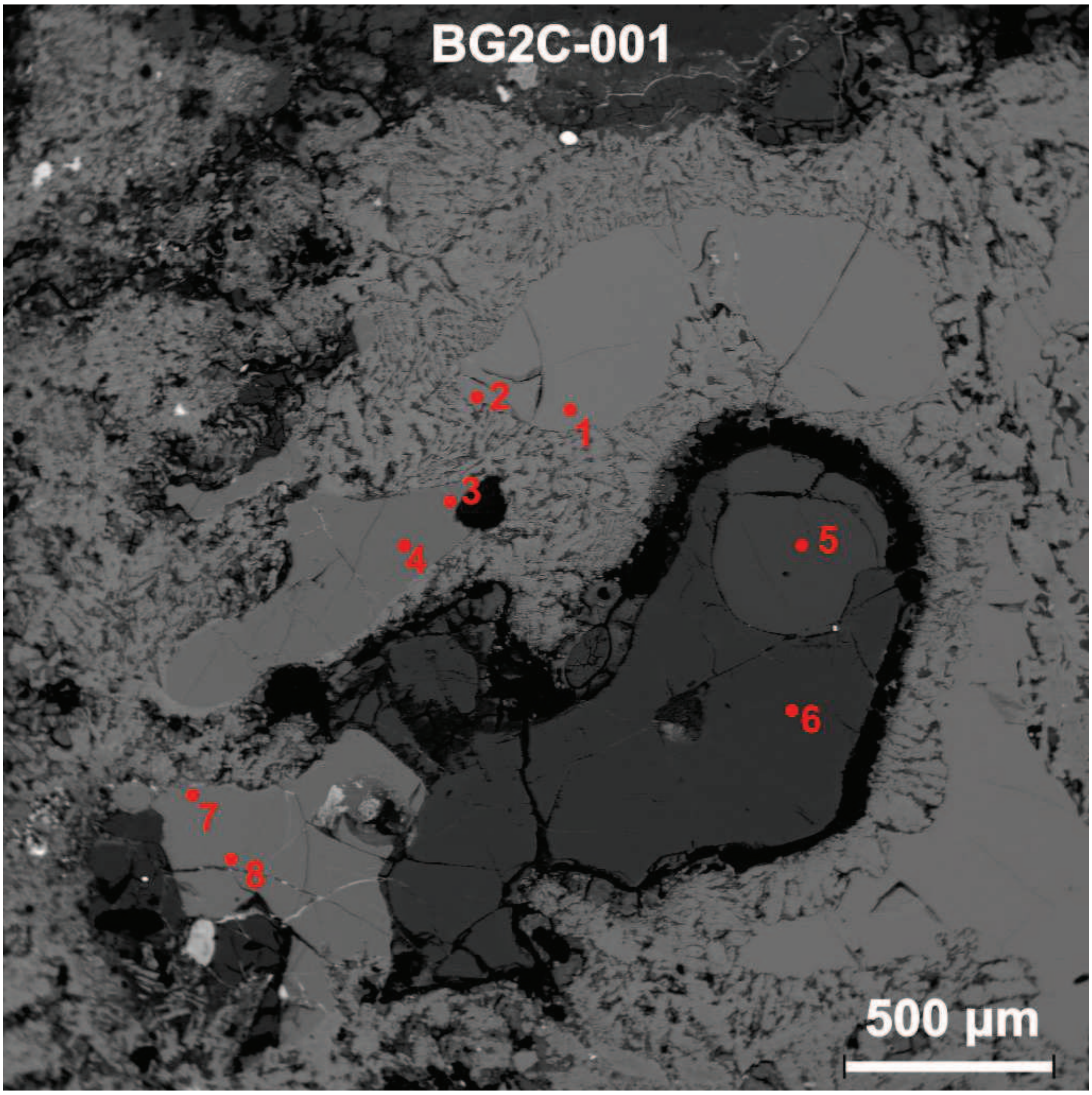

BG2-026
1
7
9
8
10
3
2
4
5
6
11
12
500 µm

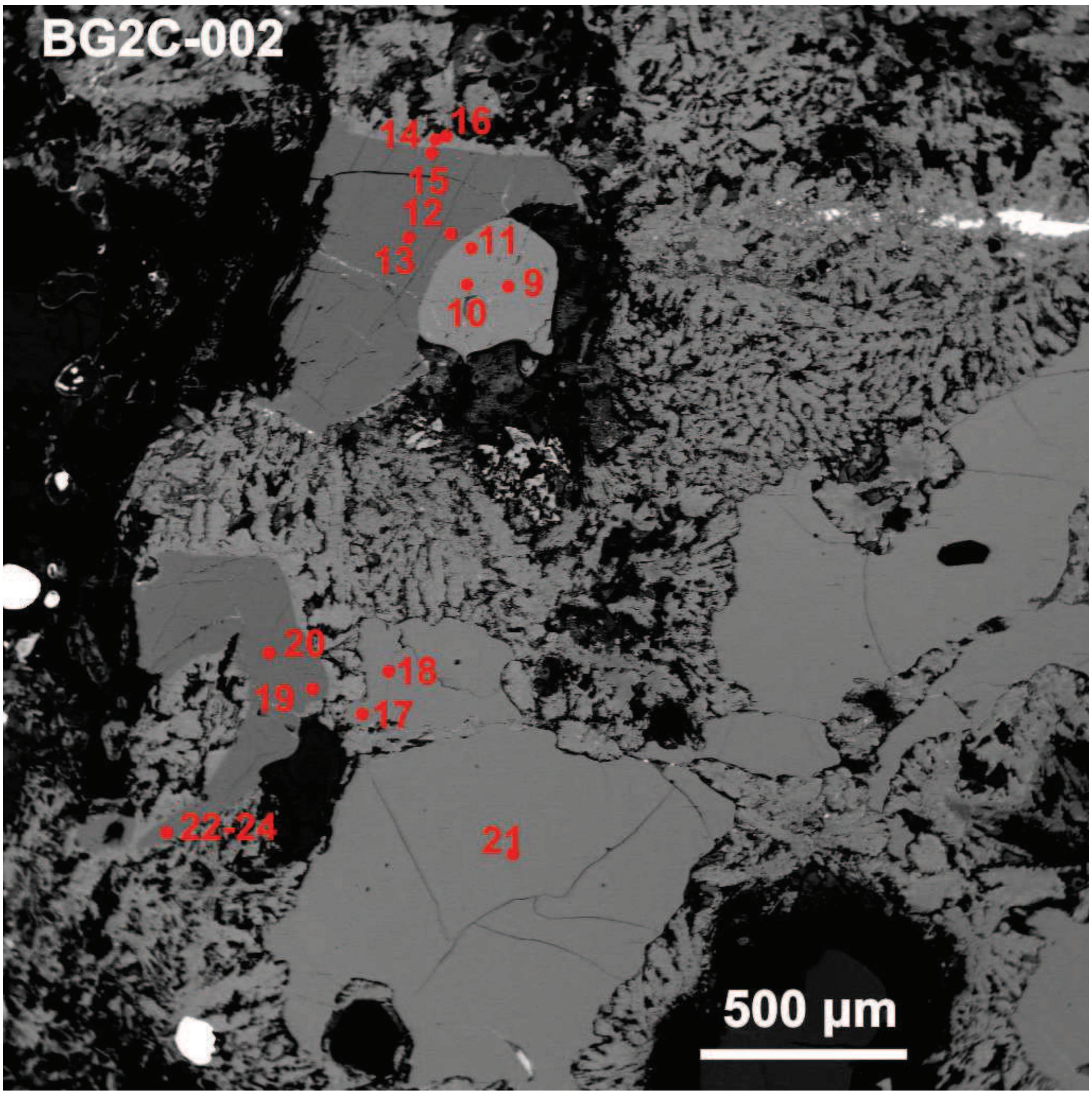

BG2-027
1
2
3
4
5
6
200 µm

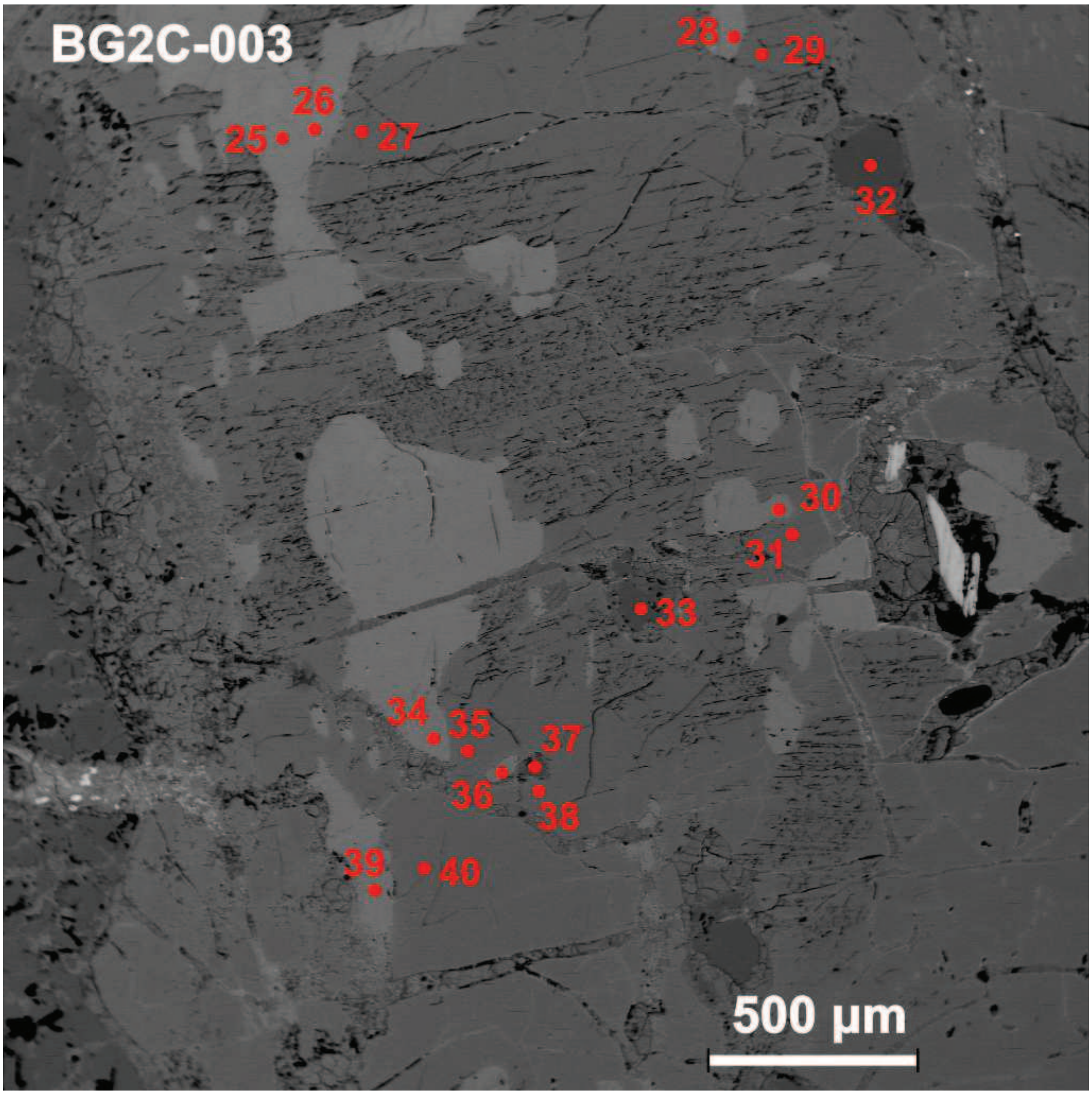

BG2-028
1
2
3
5
4
6
8
7
9
10
500 µm

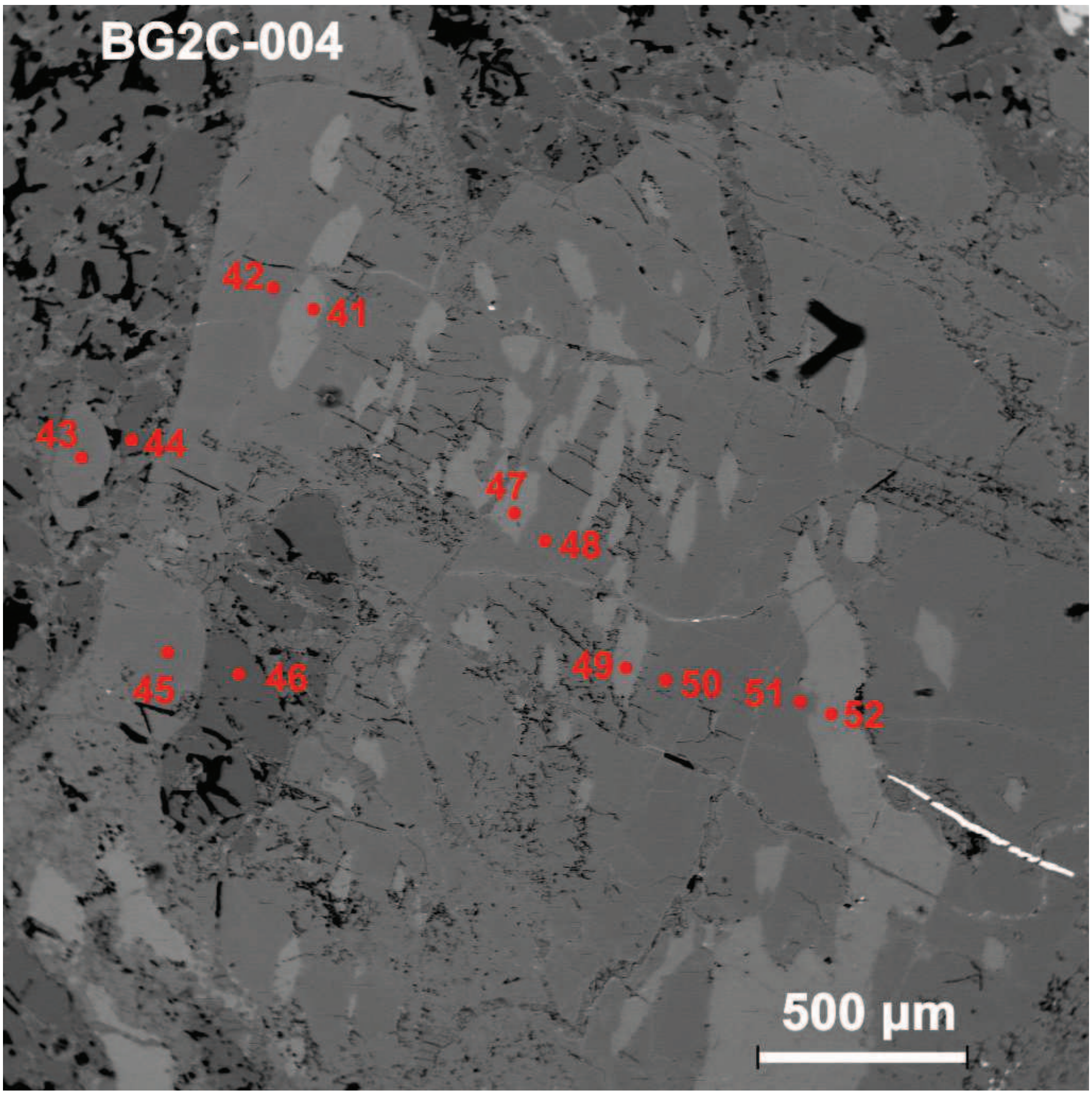

BG2-029
1
2
3
4
7
5
6
200 µm

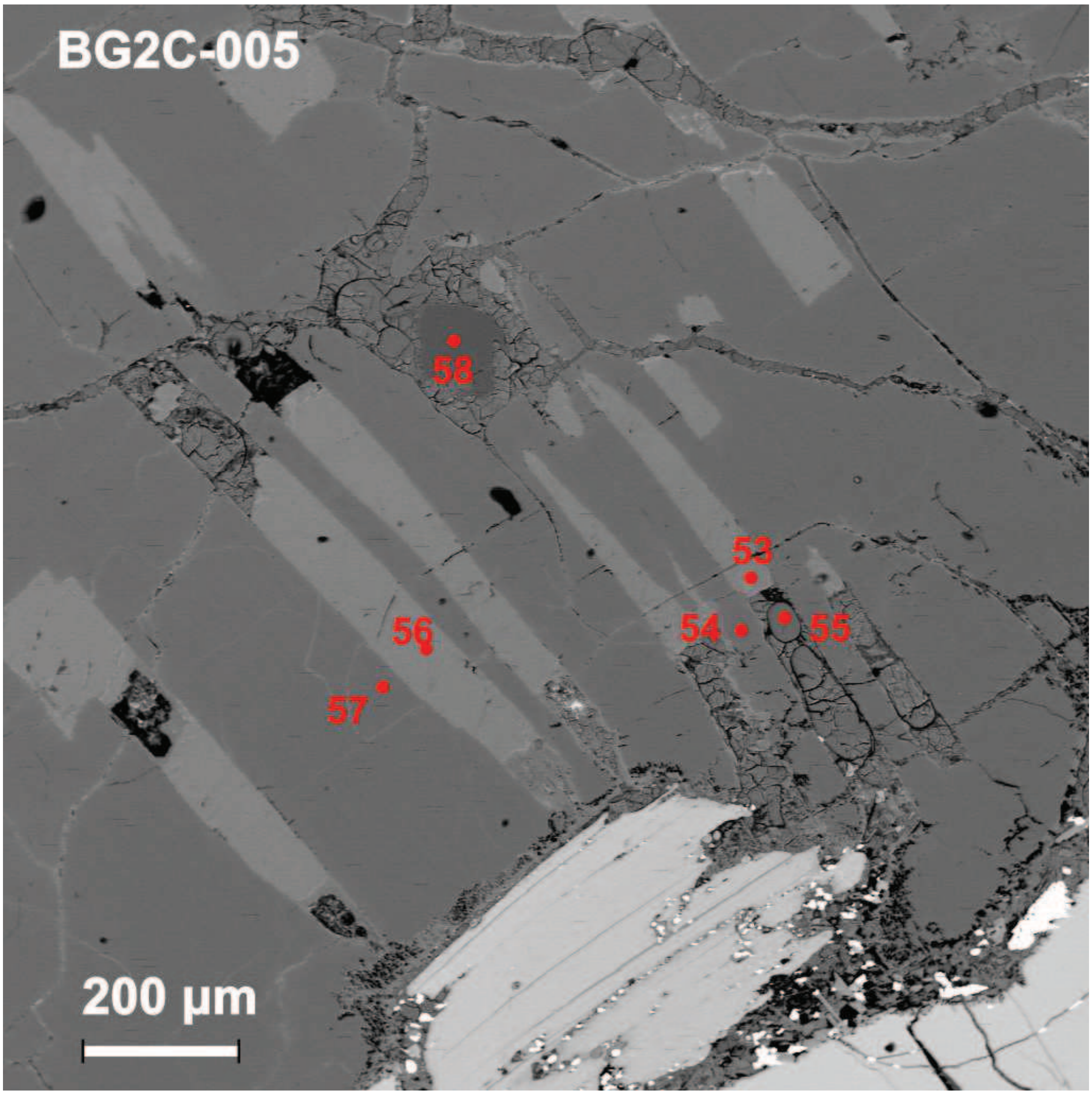

BG2-030
5
7
1
6
2
4
3
100 µm

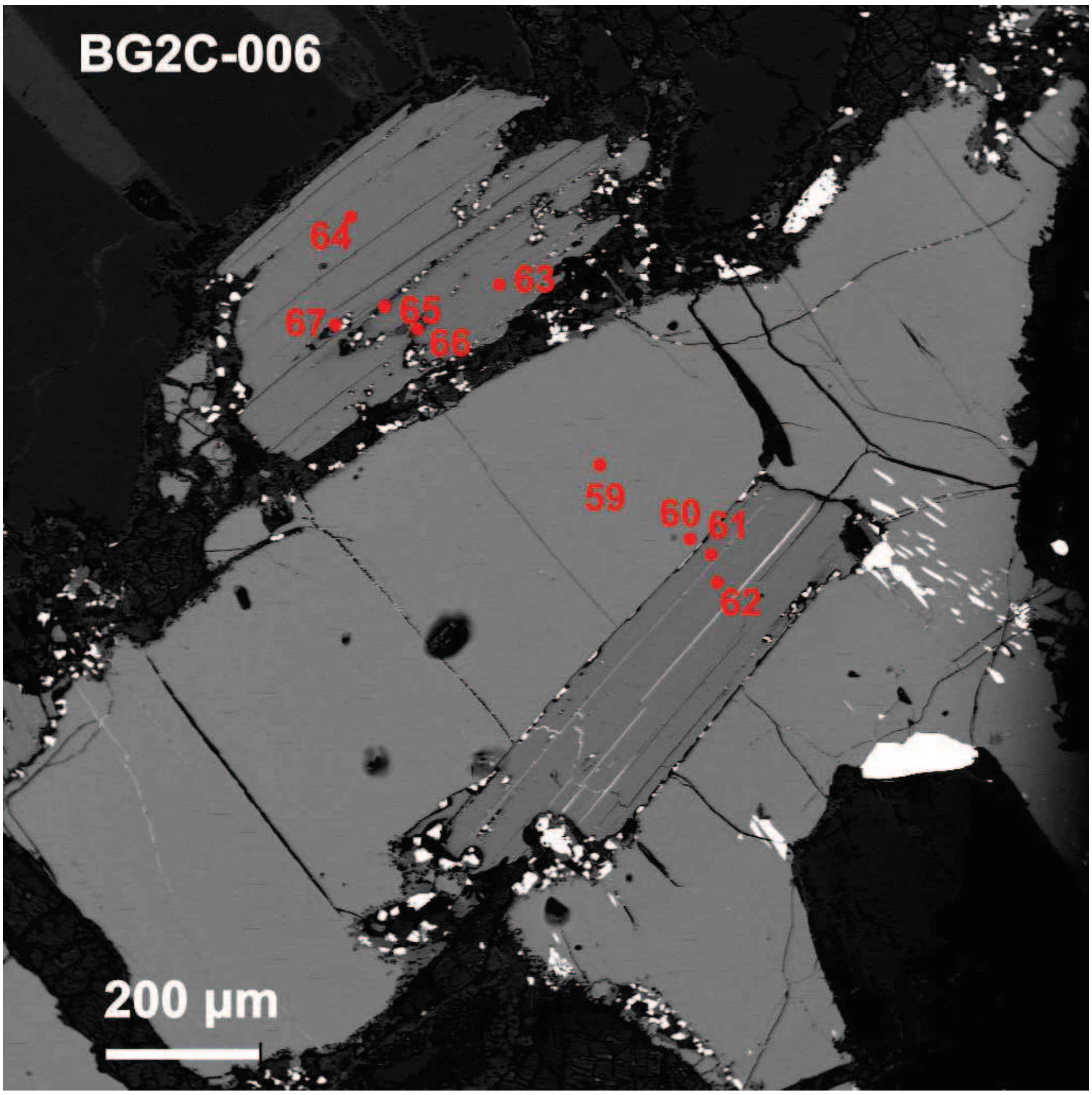

BG2C-001
1
2
3
4
5
6
7
8
500 µm

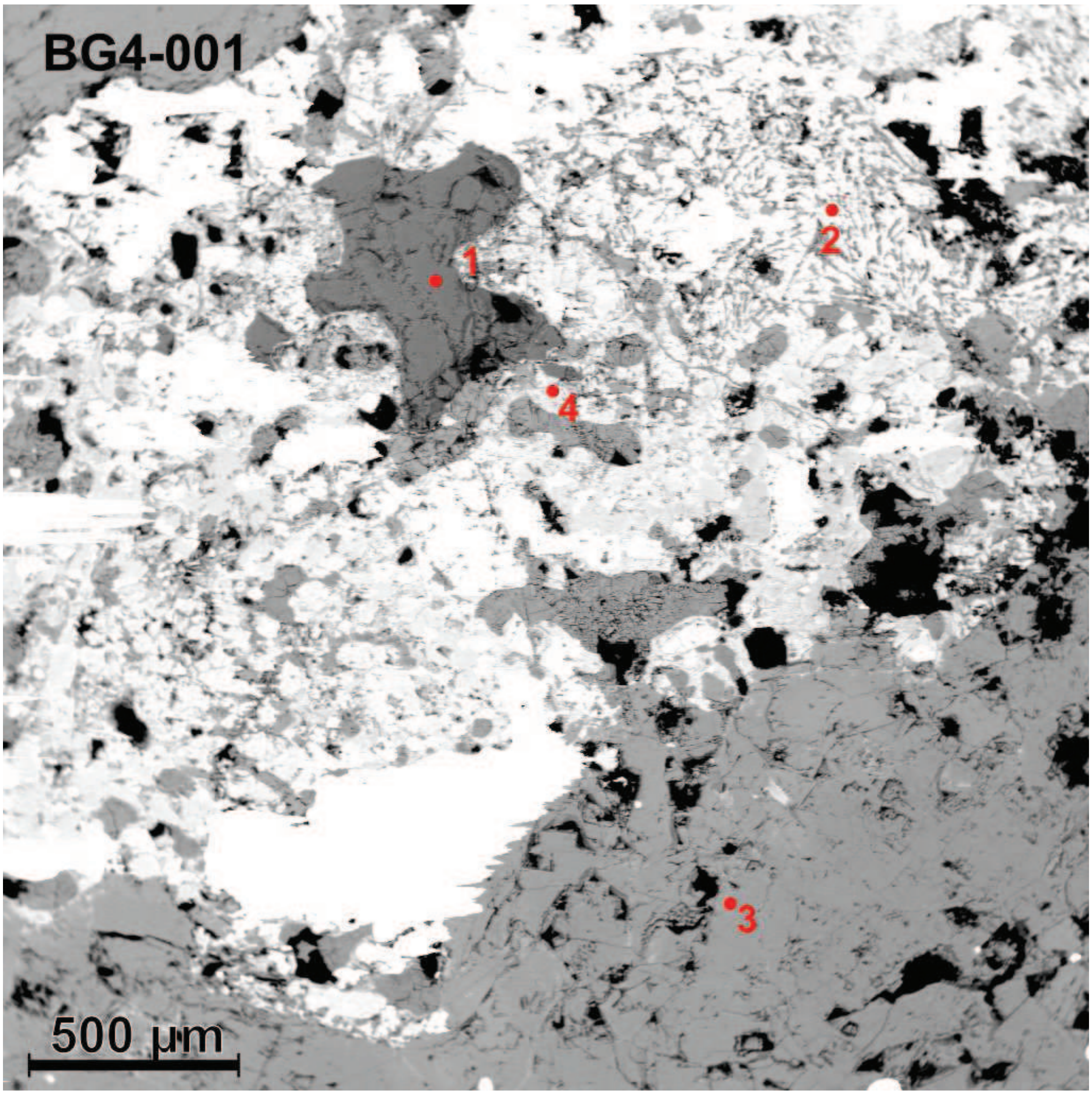

BG2C-002
9
10
11
12
13
14
15
16
17
18
19
20
21
22-24
500 µm

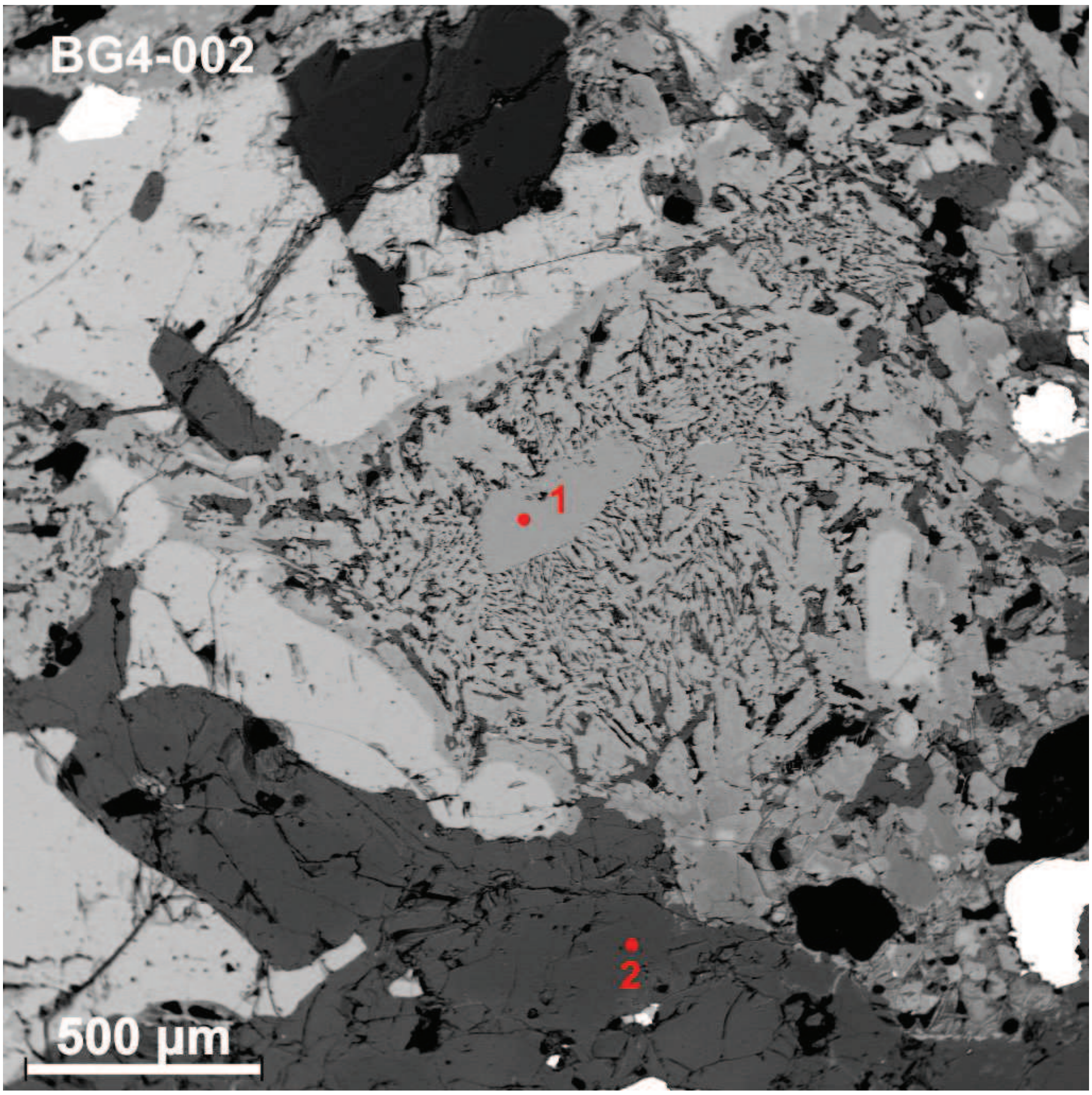

BG2C-003
25
26
27
28
29
32
30
31
33
34
35
36
37
38
39
40
500 µm

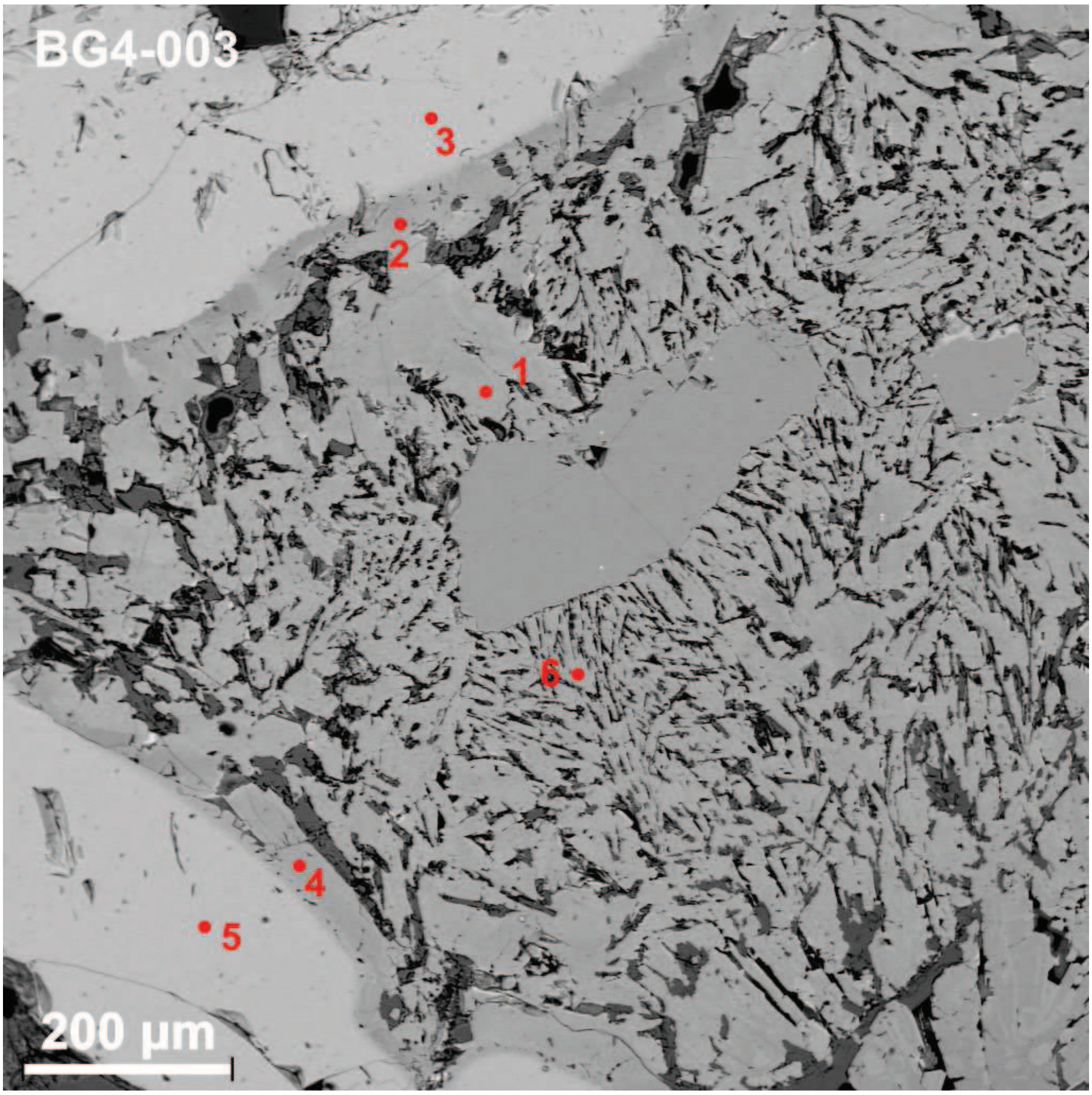

BG2C-004
42
41
43
44
47
48
45
46
49
50
51
52
500 µm

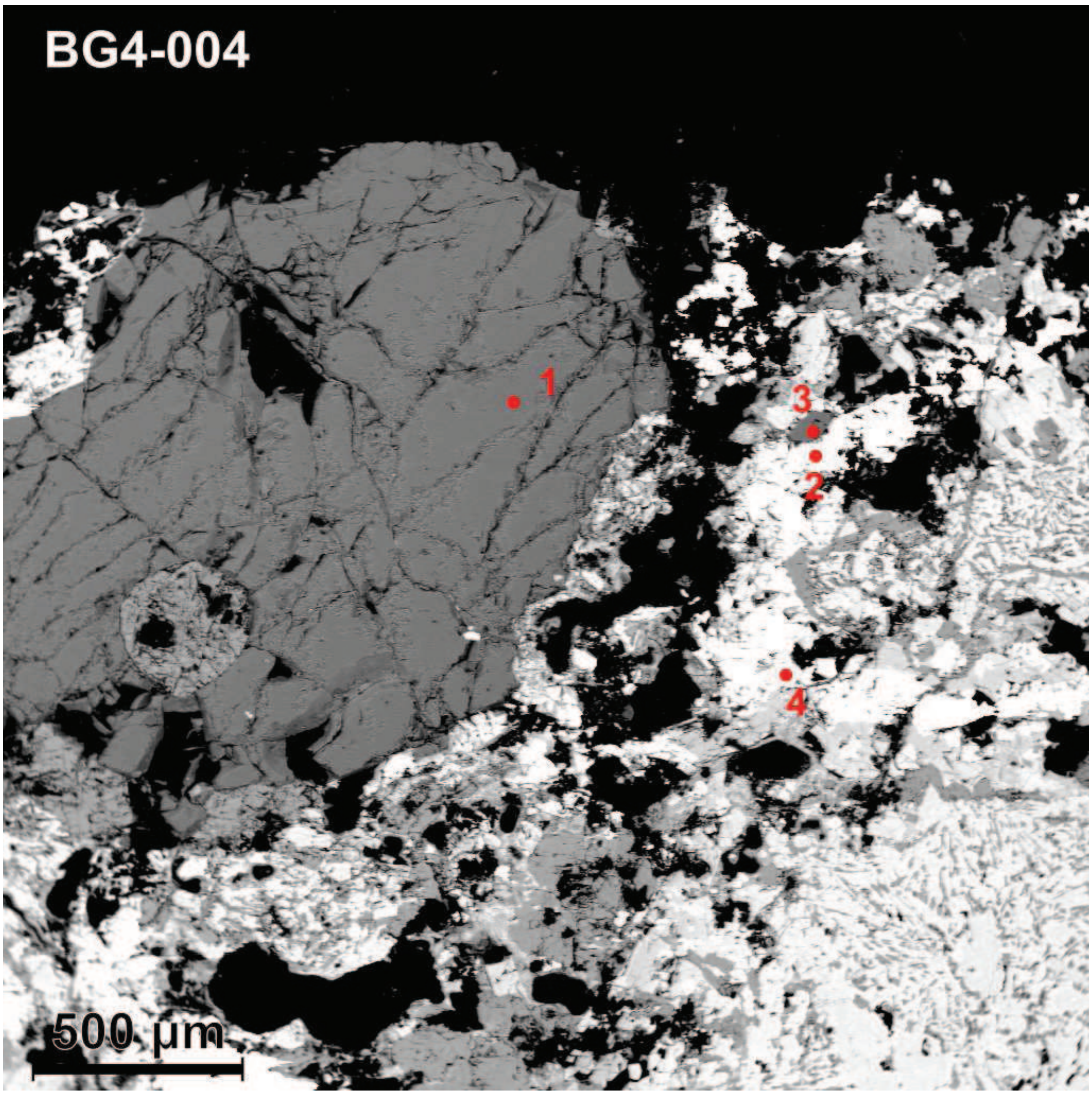

BG2C-005
58
53
54
55
56
57
200 µm

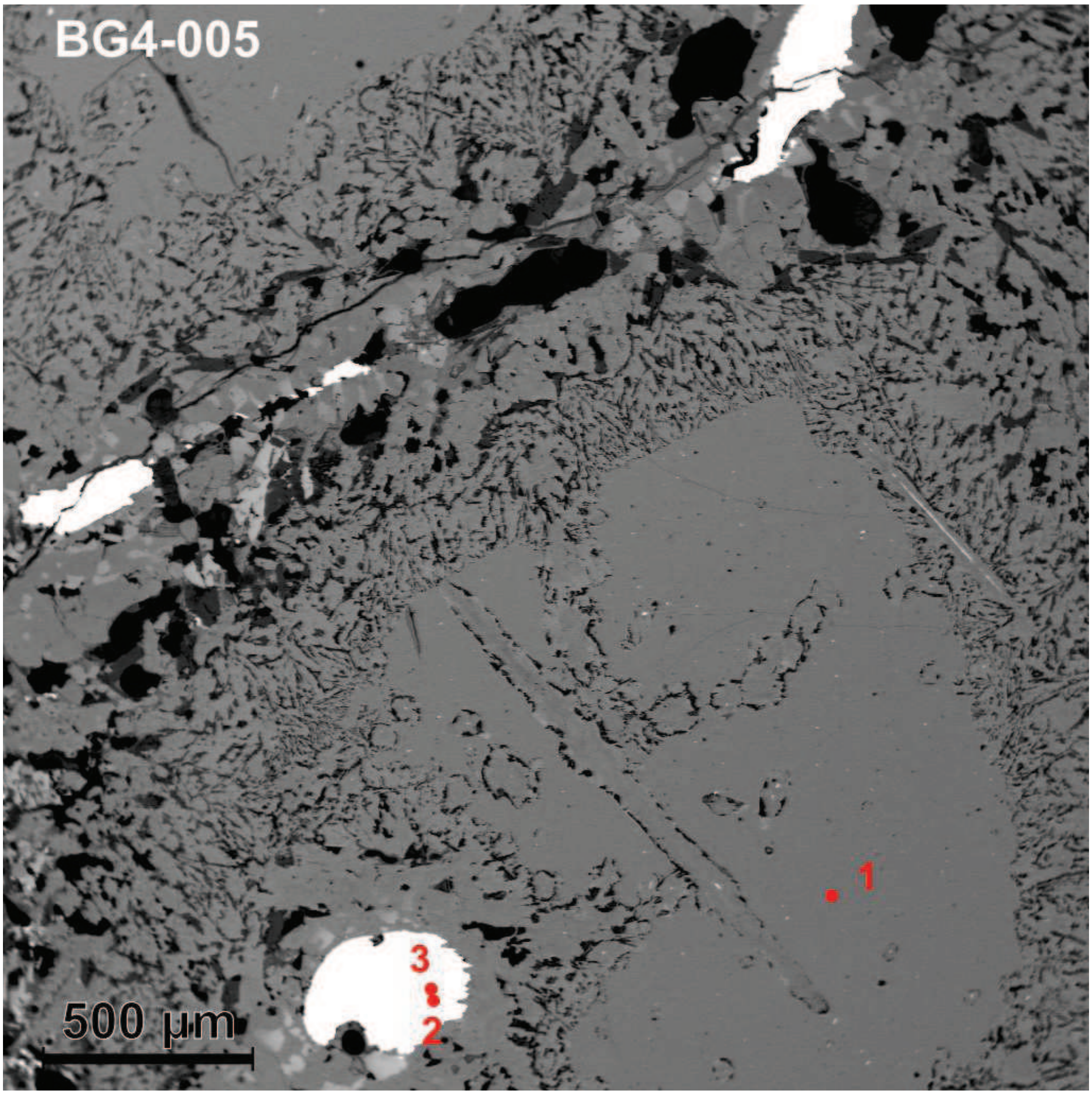

BG2C-006
64
63
67
65
66
59
60
61
62
200 µm

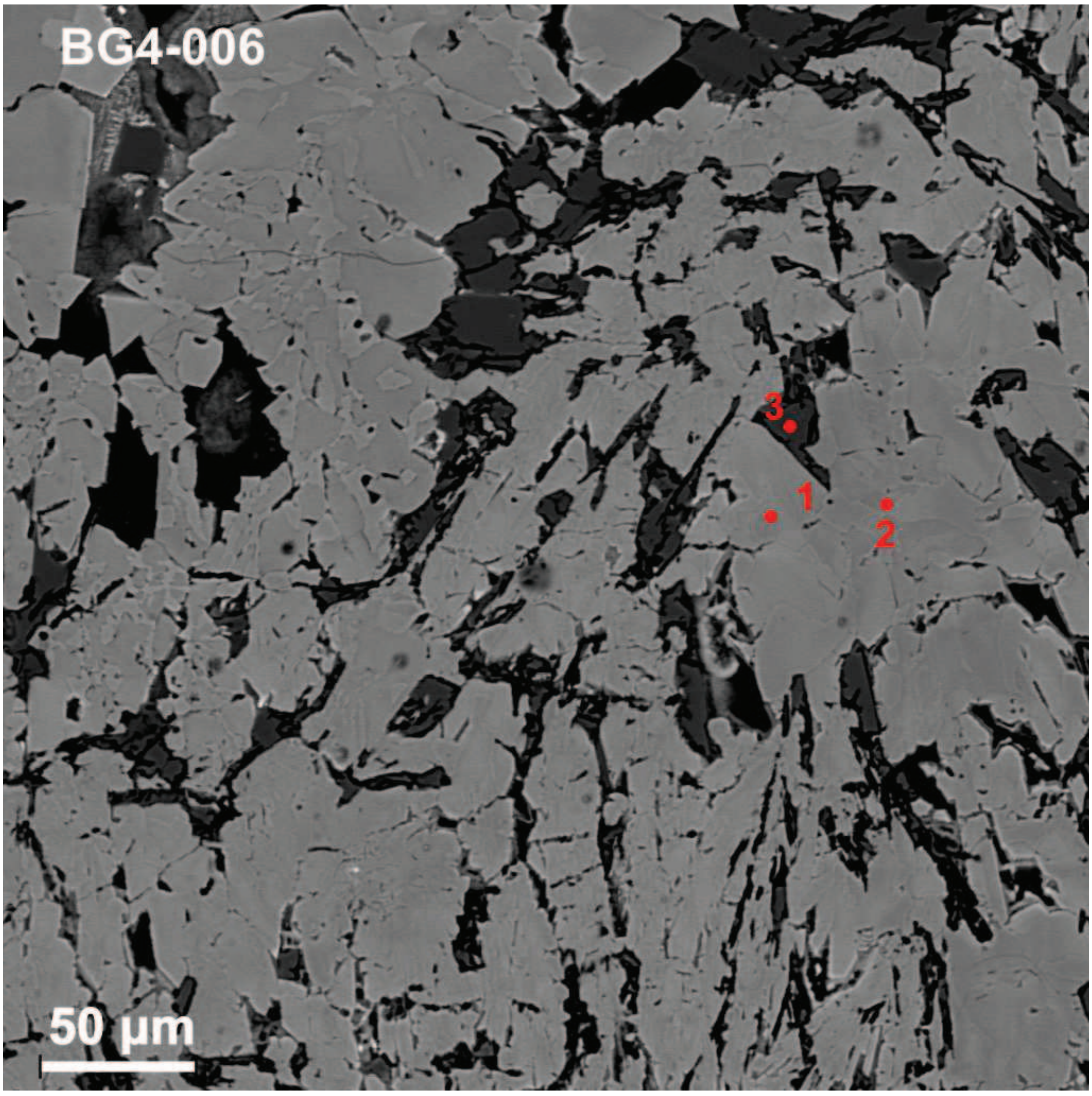

BG4-001
1
2
3
4
500 µm

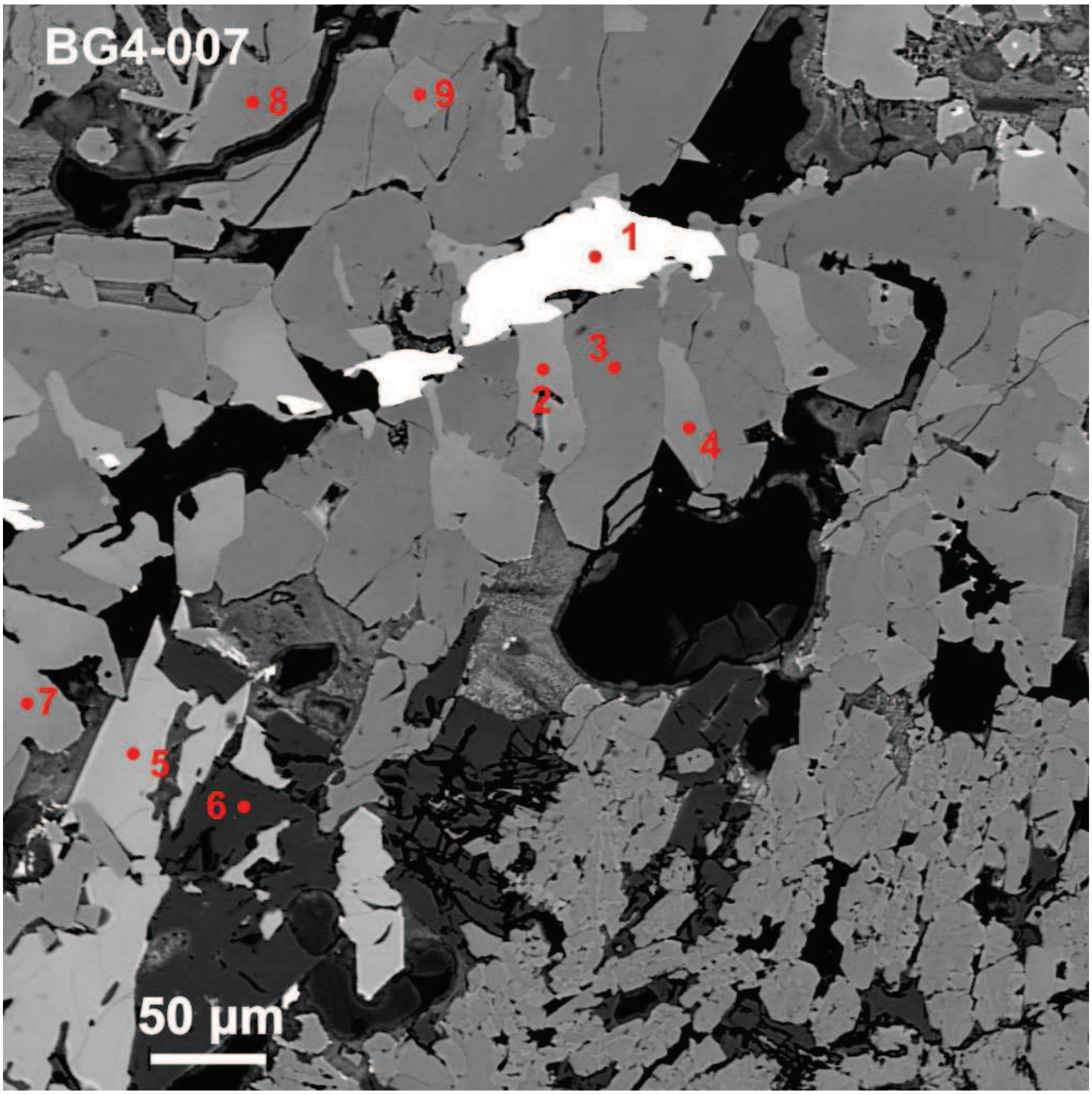

BG4-002
1
2
500 µm

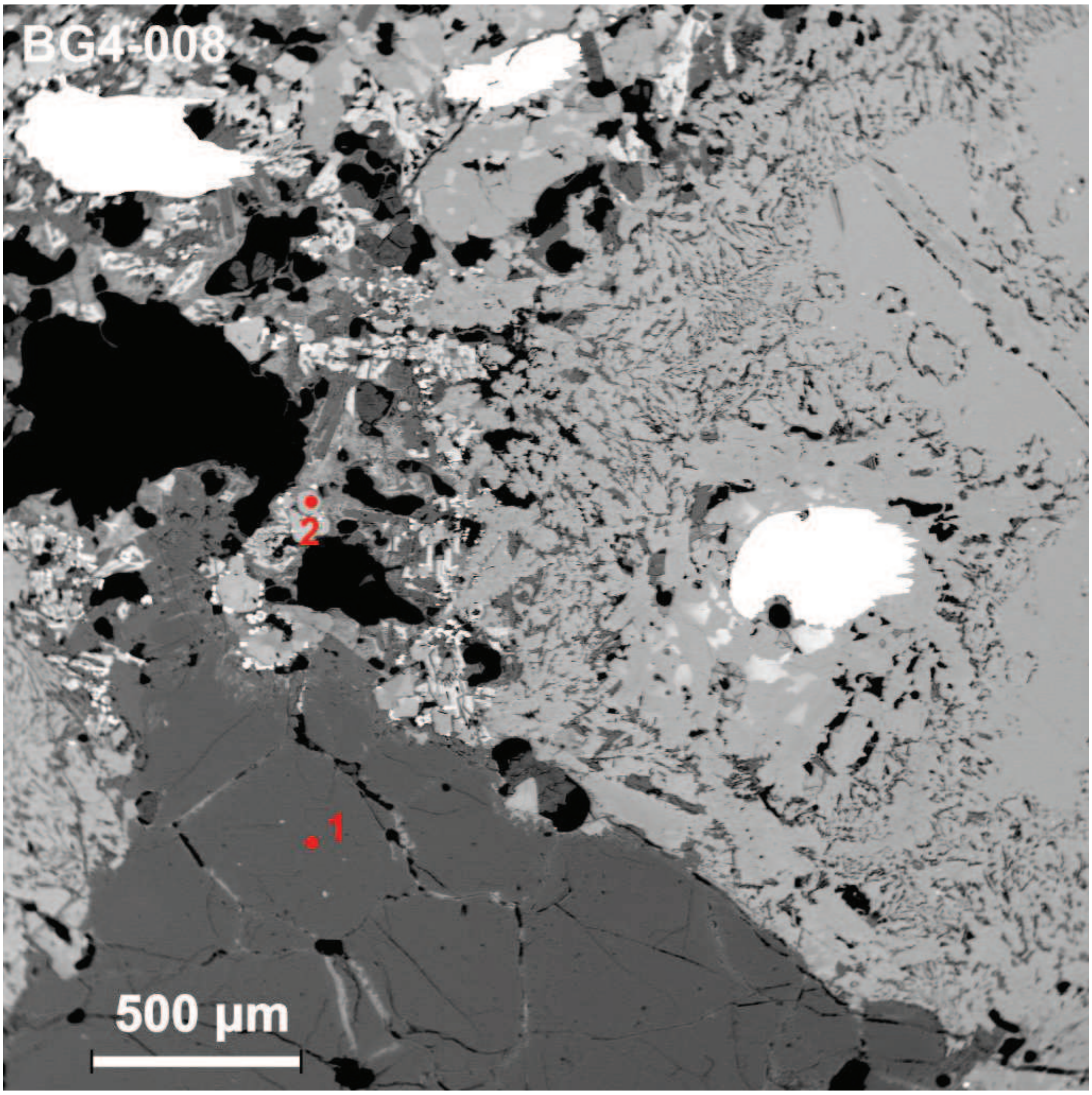

BG4-003
1
2
3
4
5
6
200 µm

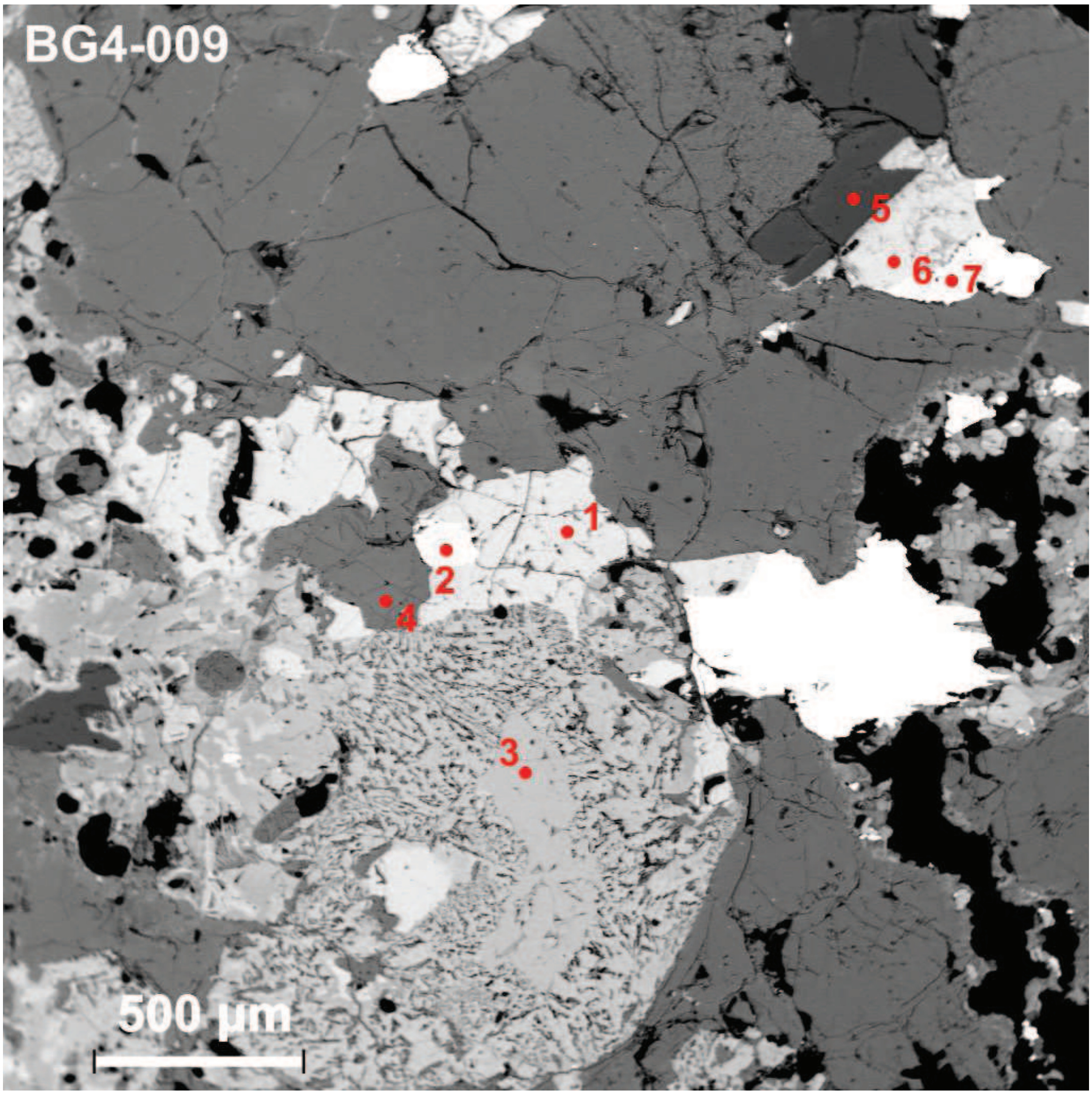

BG4-004
1
2
3
4
500 µm

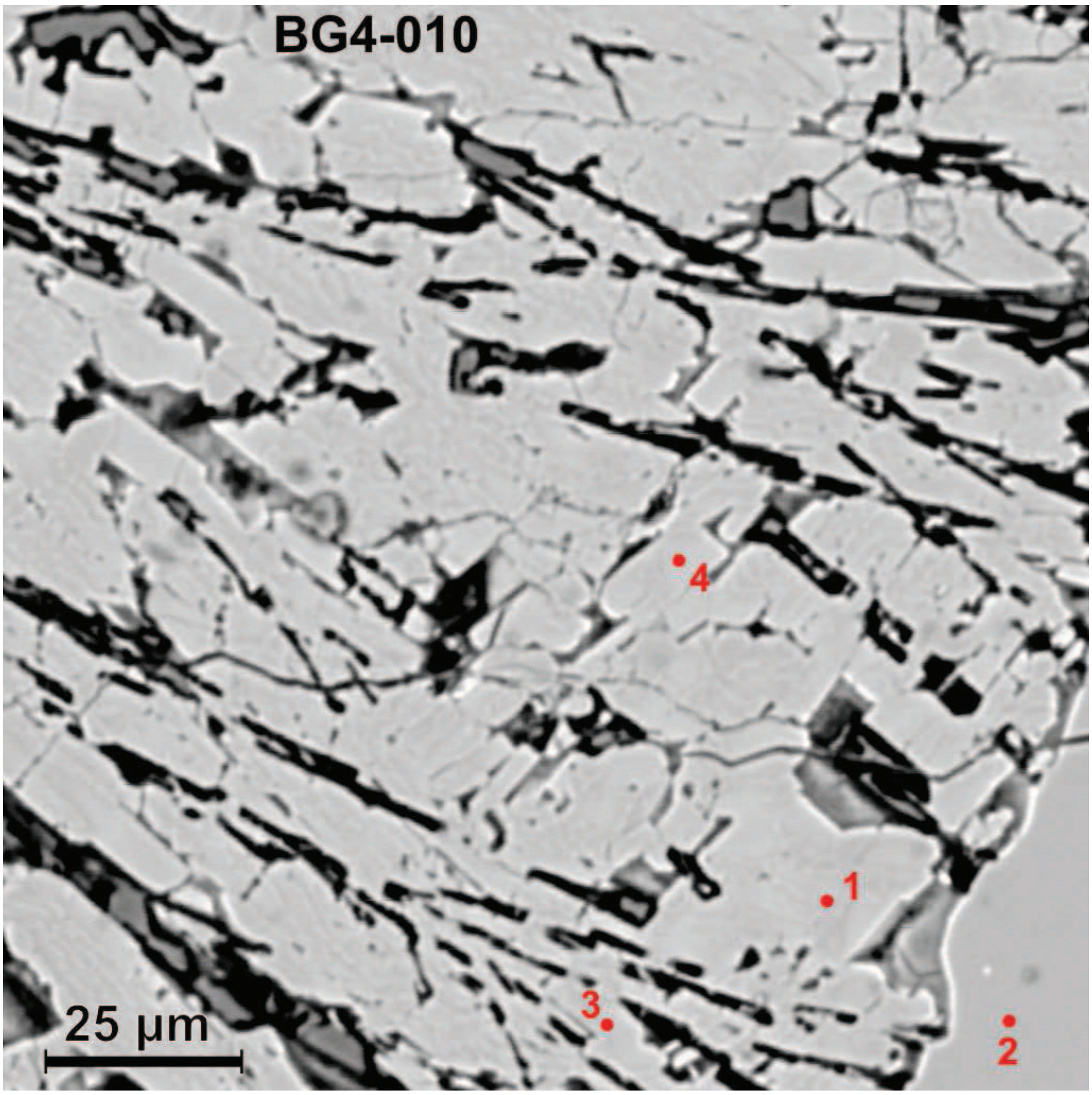

BG4-005
1
3
2
500 µm

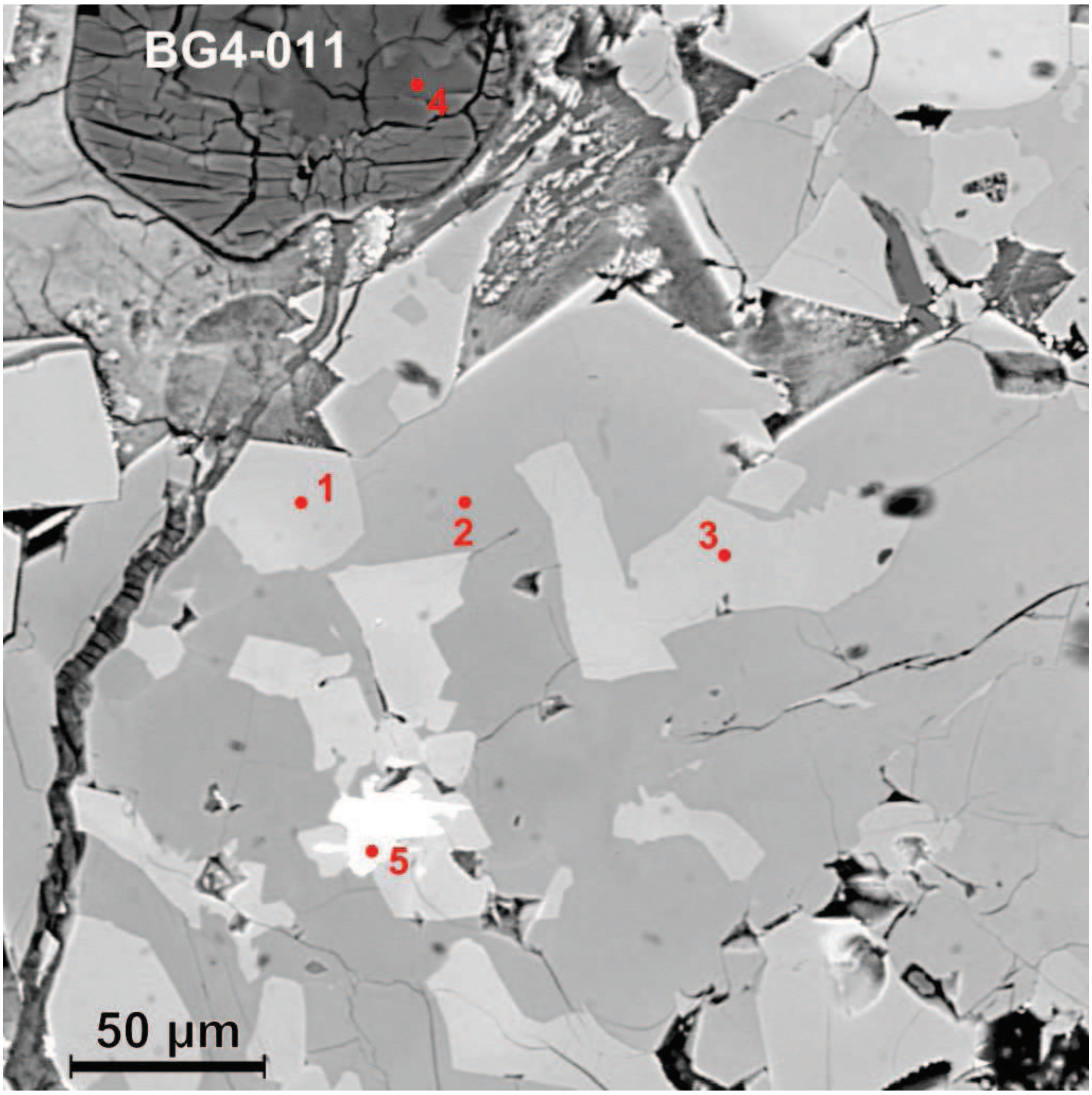

BG4-006
3
1
2
50 µm

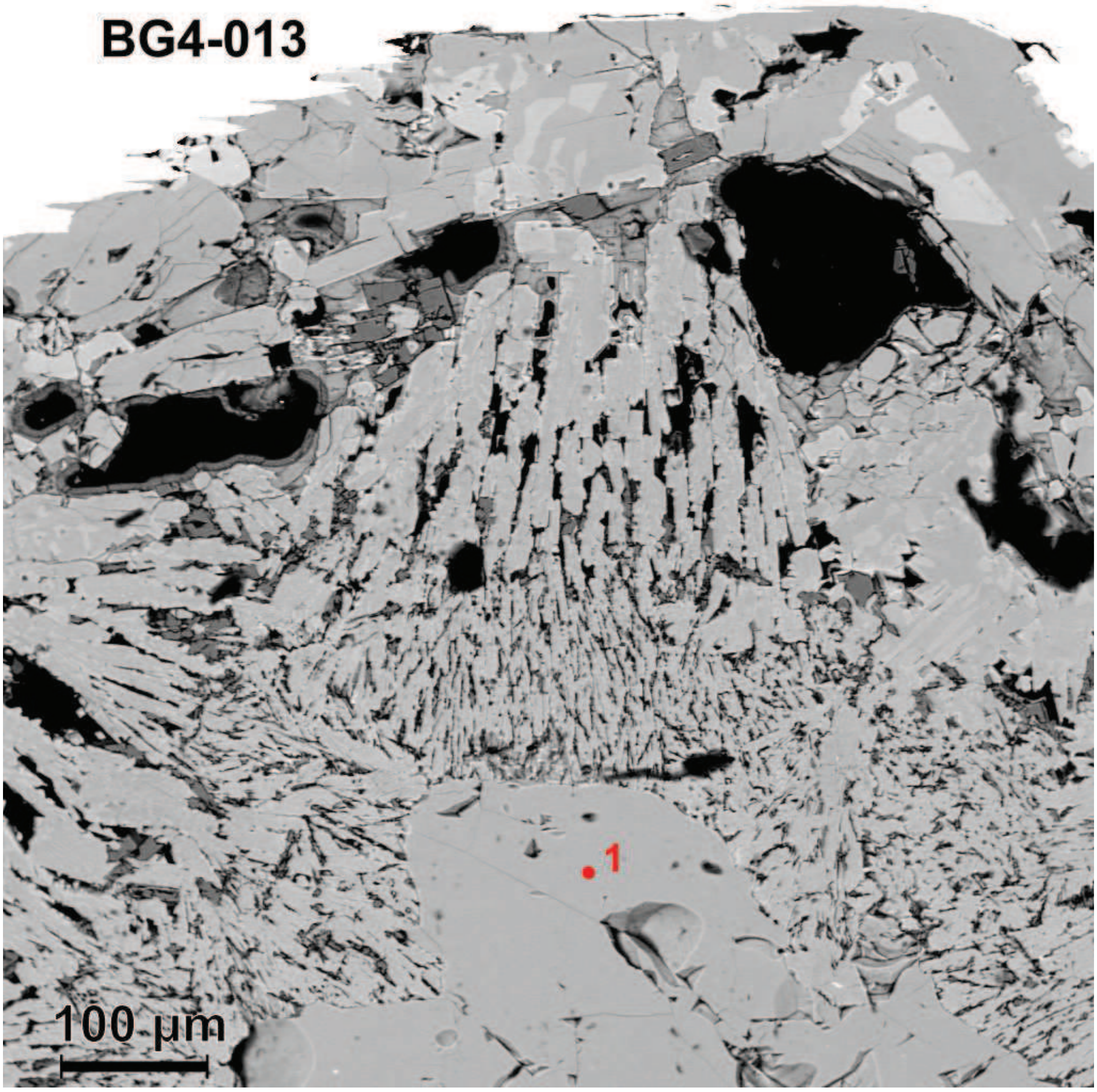

BG4-007
1
2
3
4
5
6
7
8
9
50 µm

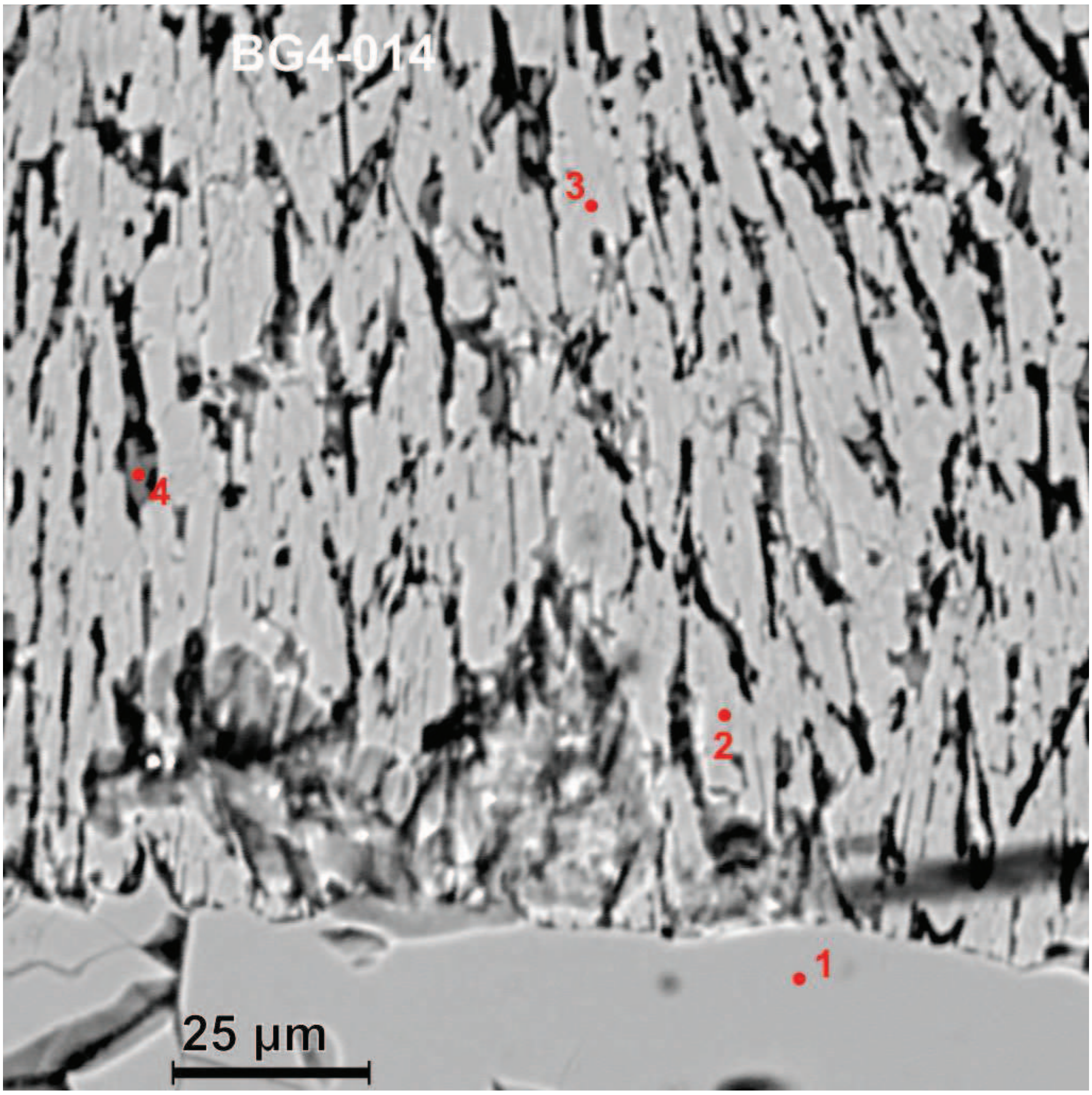

BG4-008
1
2
500 µm

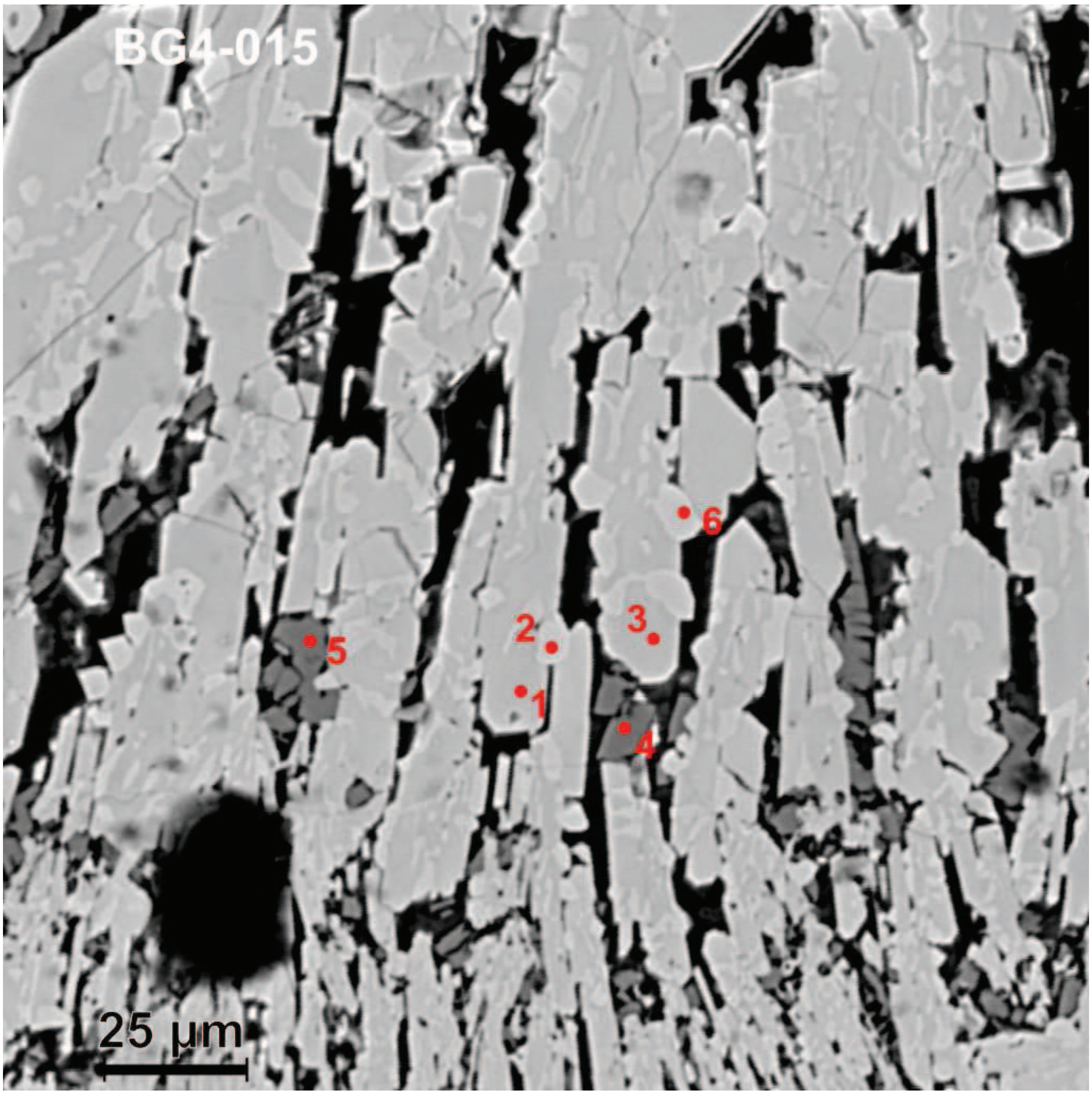

BG4-009
5
6
7
1
2
4
3
500 µm

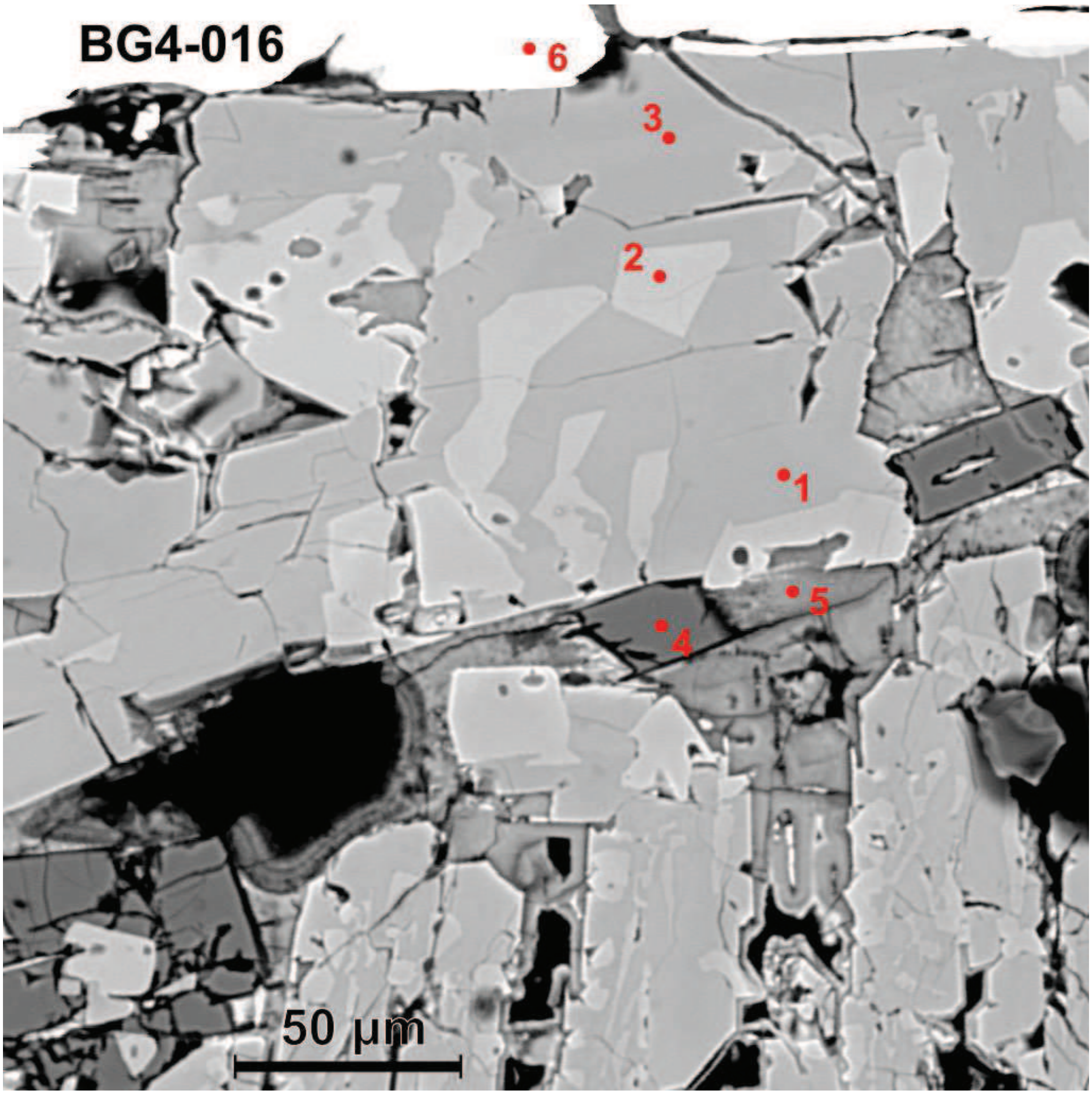

BG4-010
4
1
3
2
25 µm

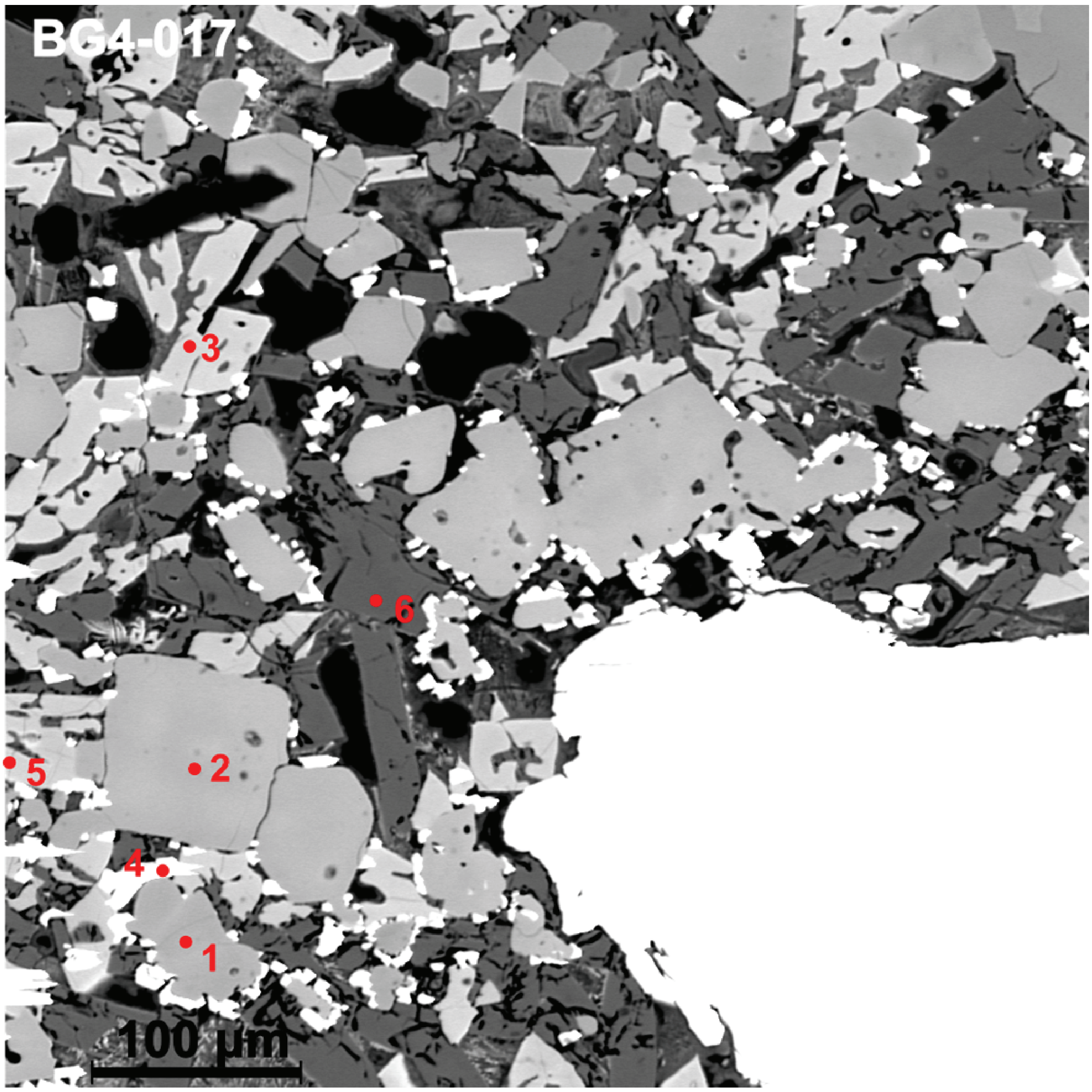

BG4-011
1
2
3
4
5
50 µm

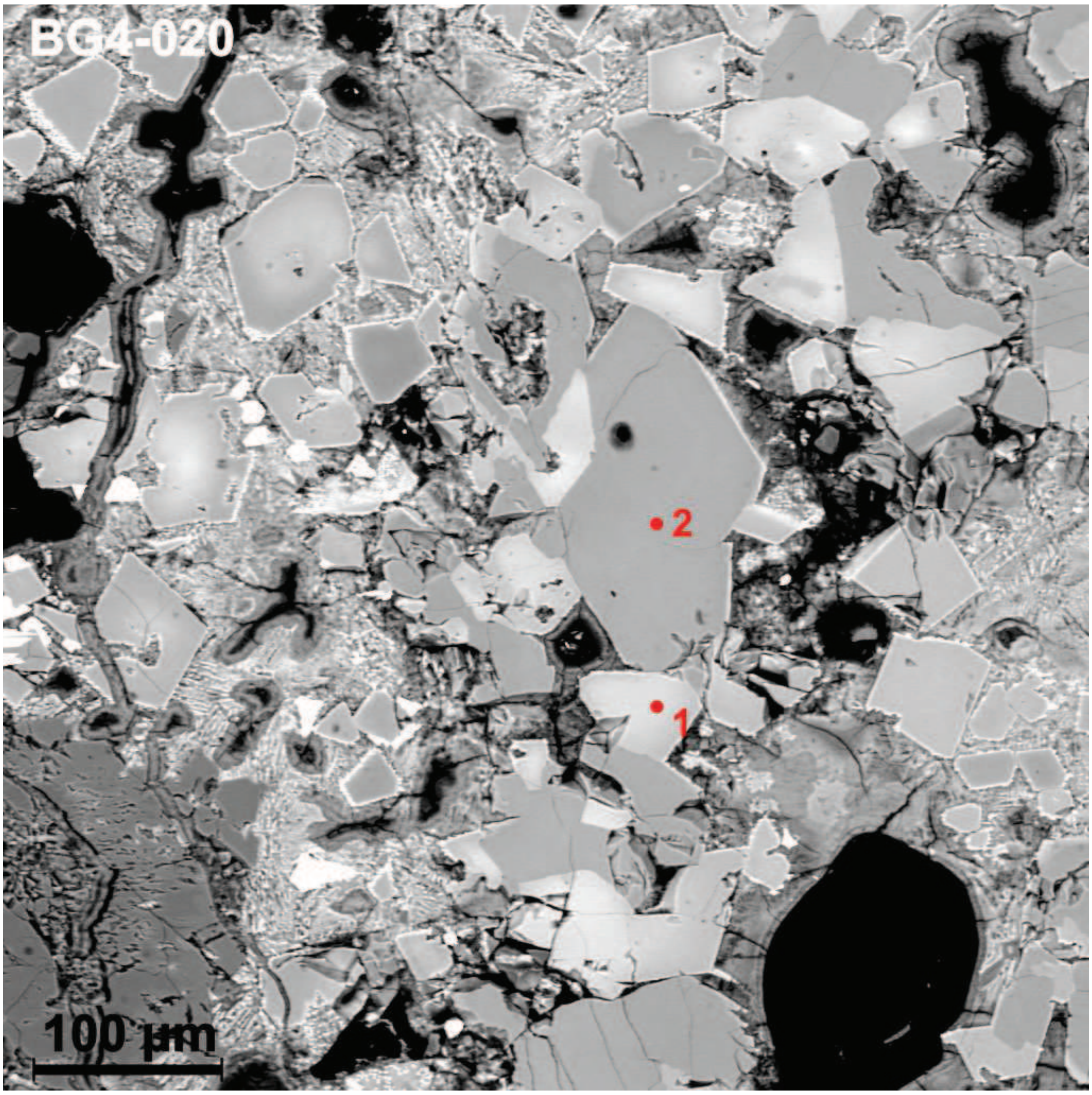

BG4-013
1
100 µm

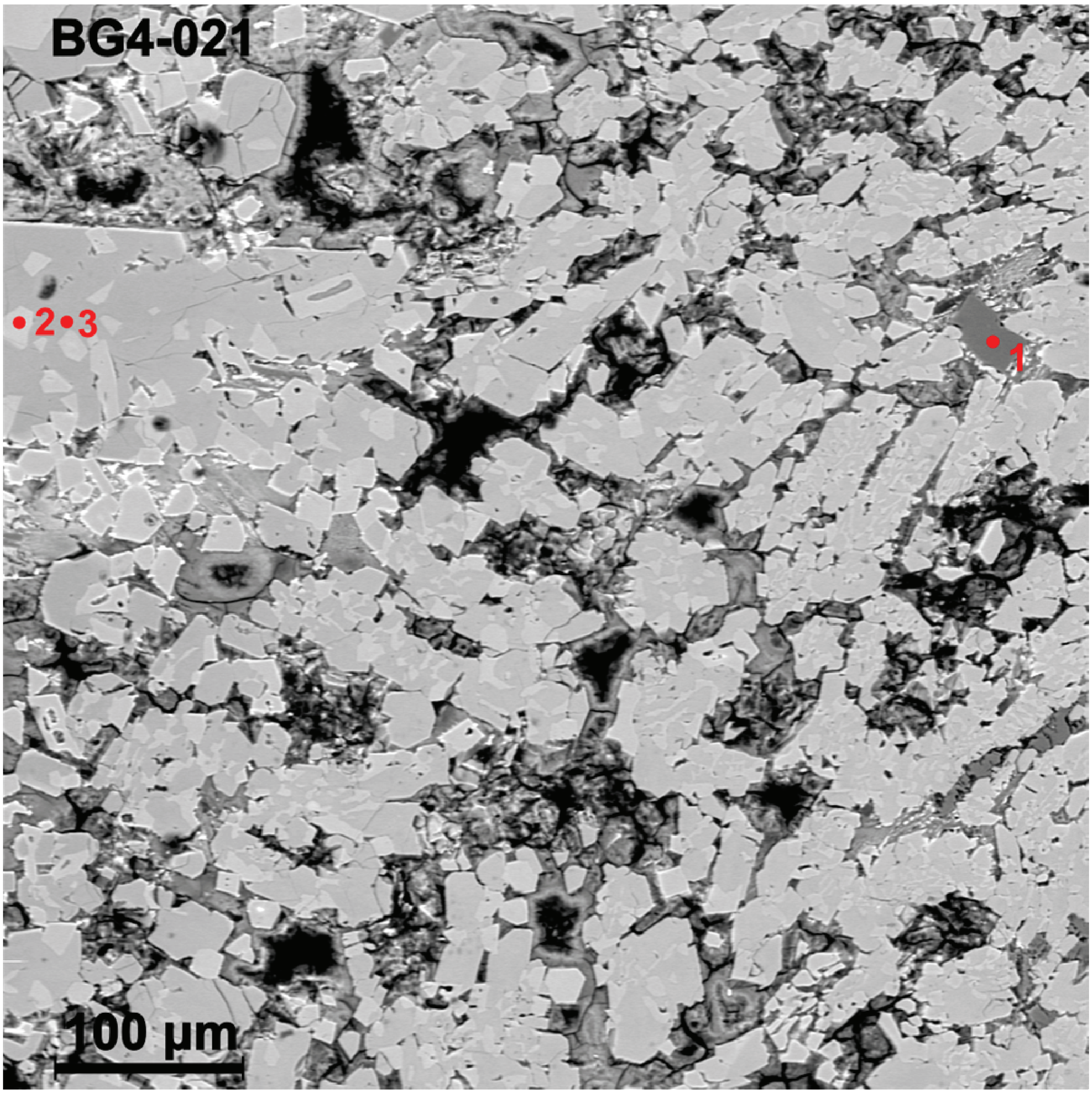

BG4-014
3
4
2
1
25 µm

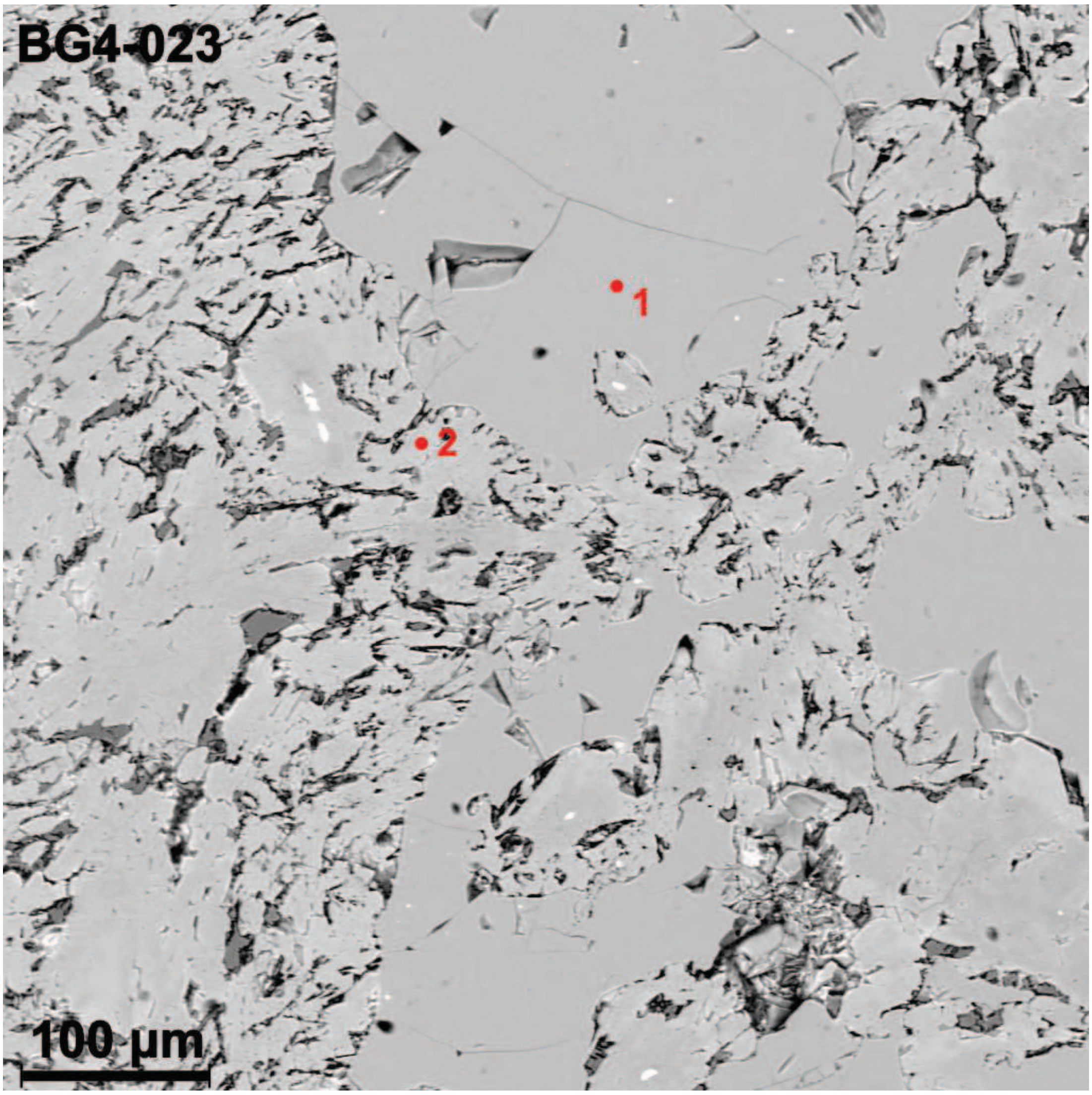

BG4-015
6
2
3
5
1
4
25 µm

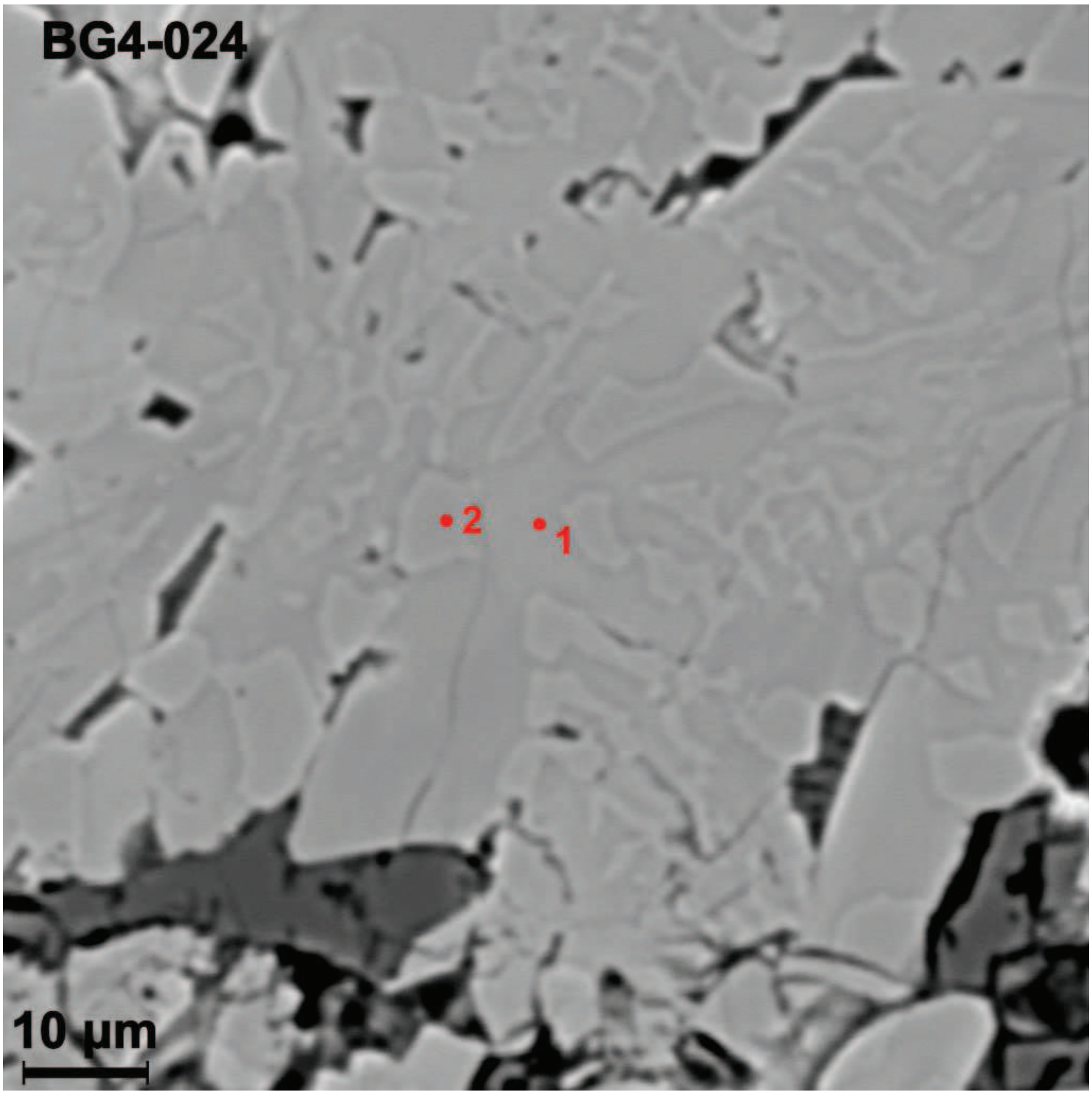

BG4-016
6
3
2
1
5
4
50 µm

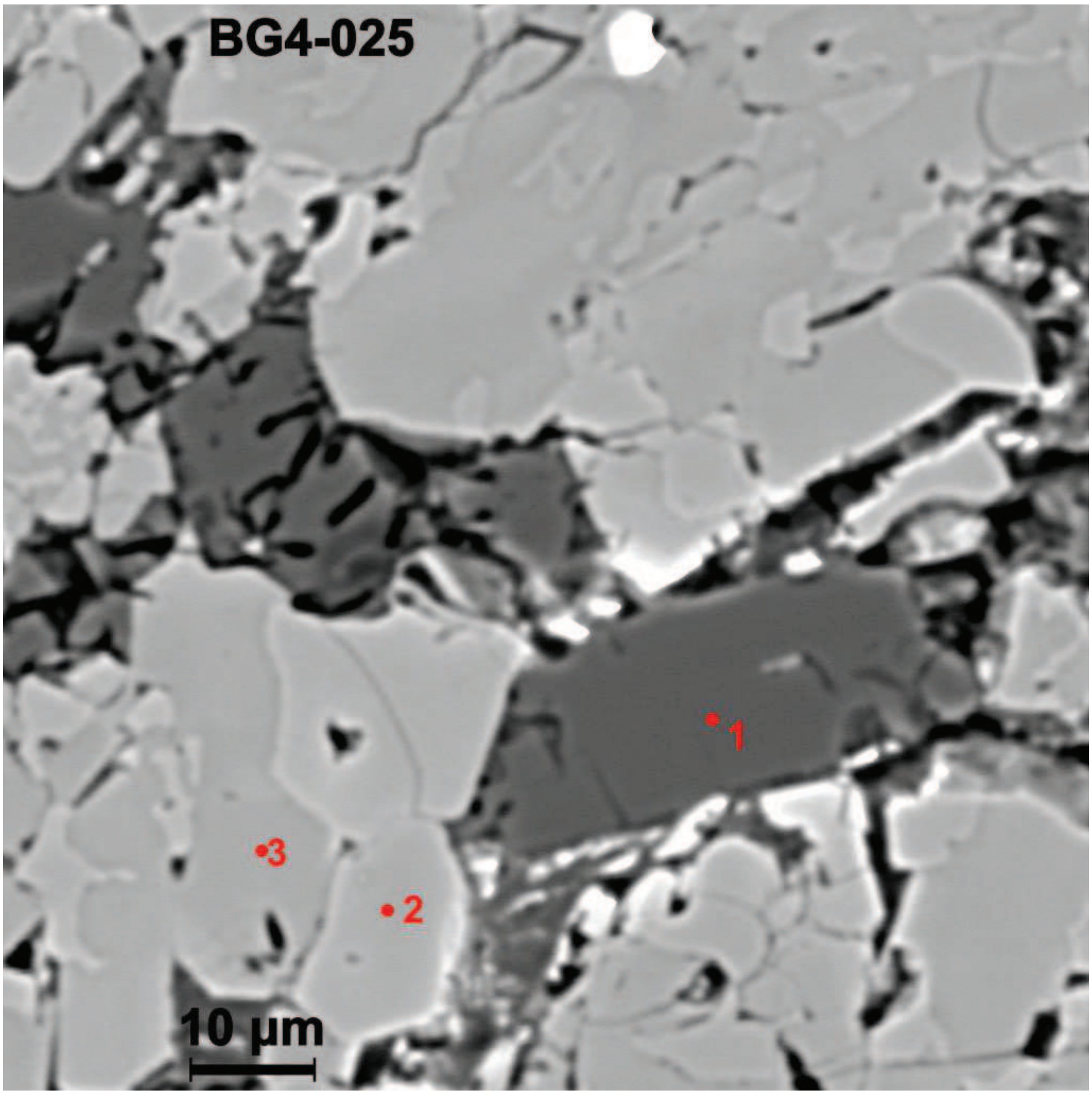

BG4-017
3
6
5
2
4
1
100 µm

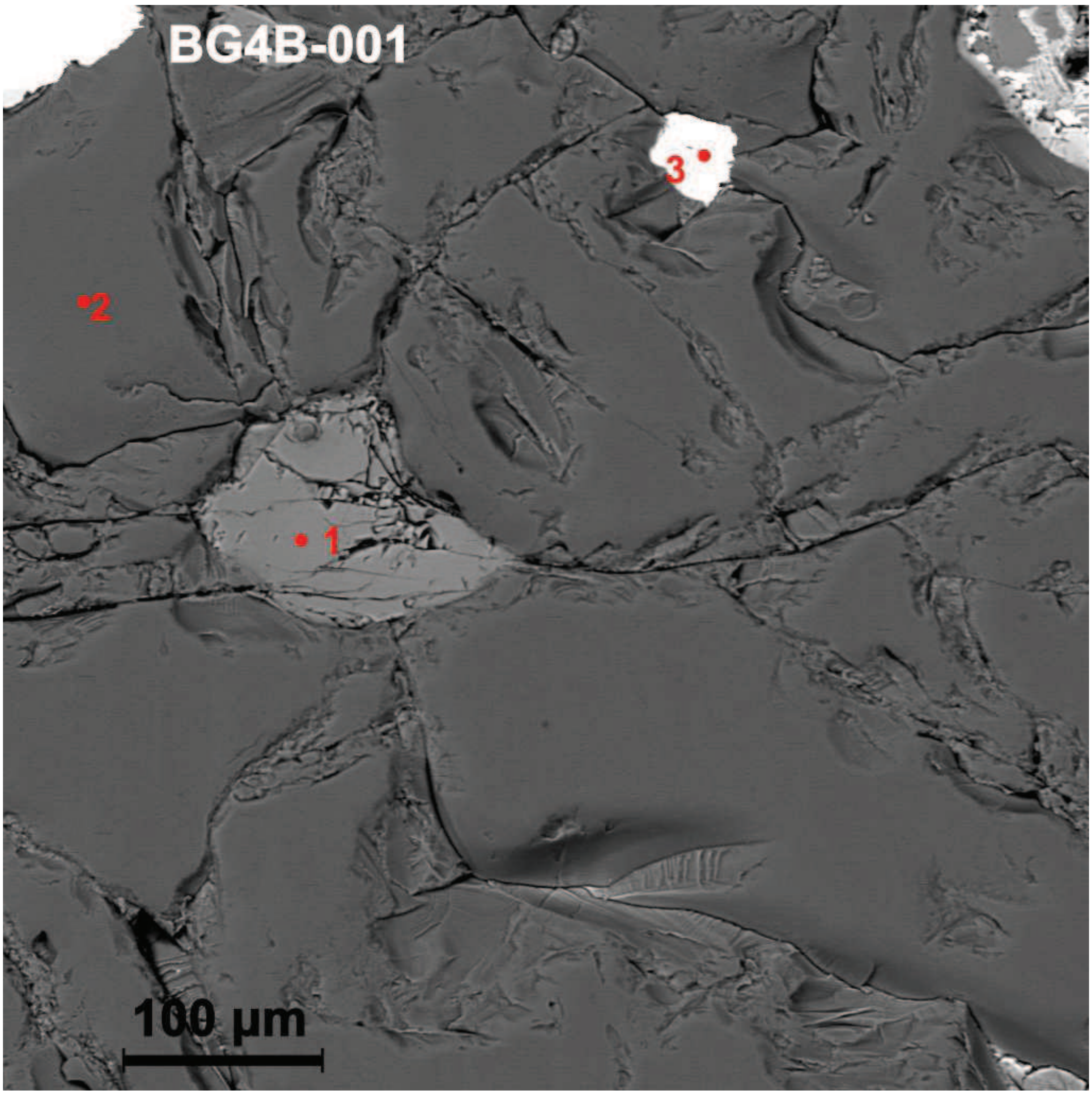

BG4-020
2
1
100 µm

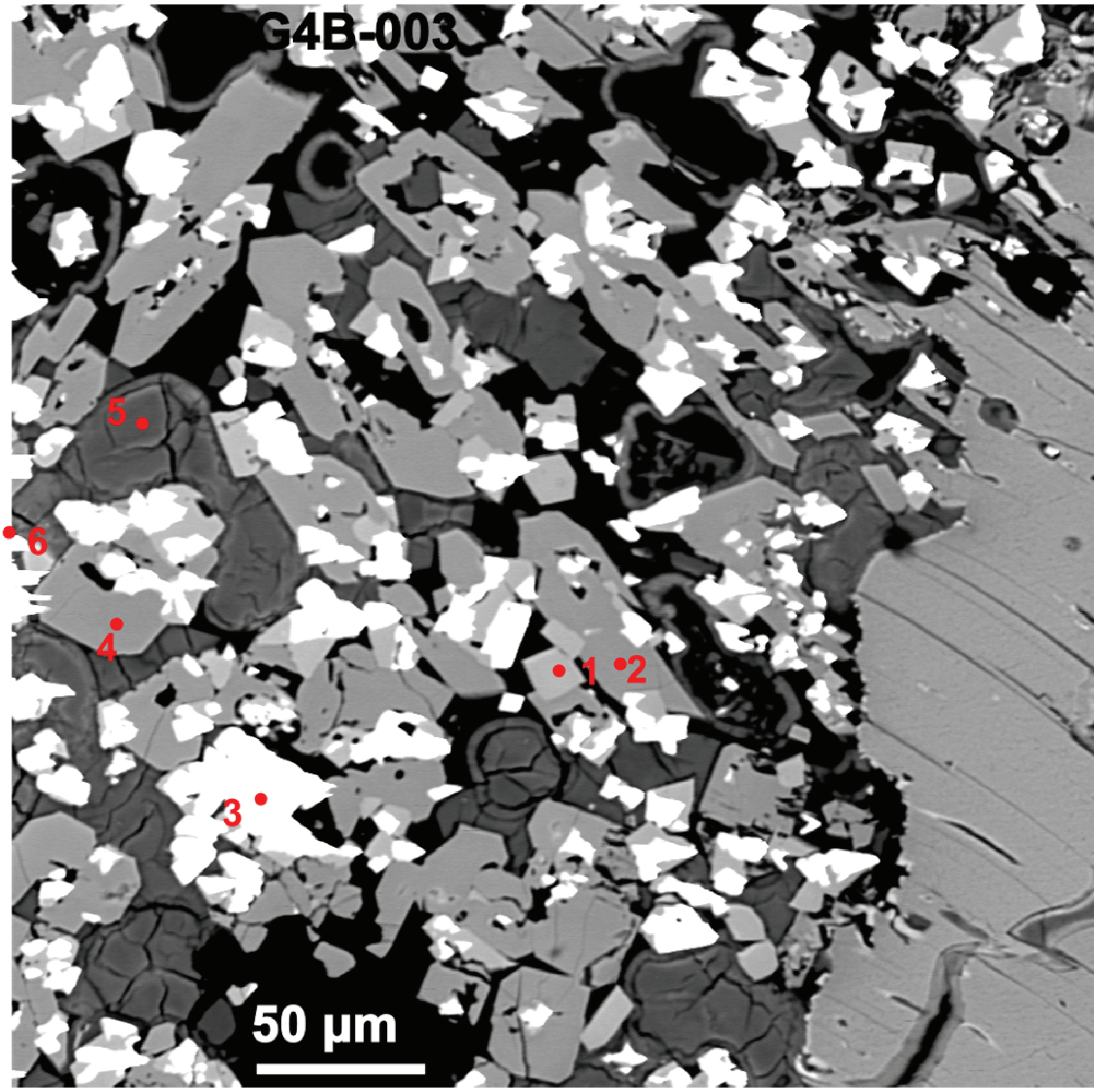

BG4-021
2
3
1
100 µm

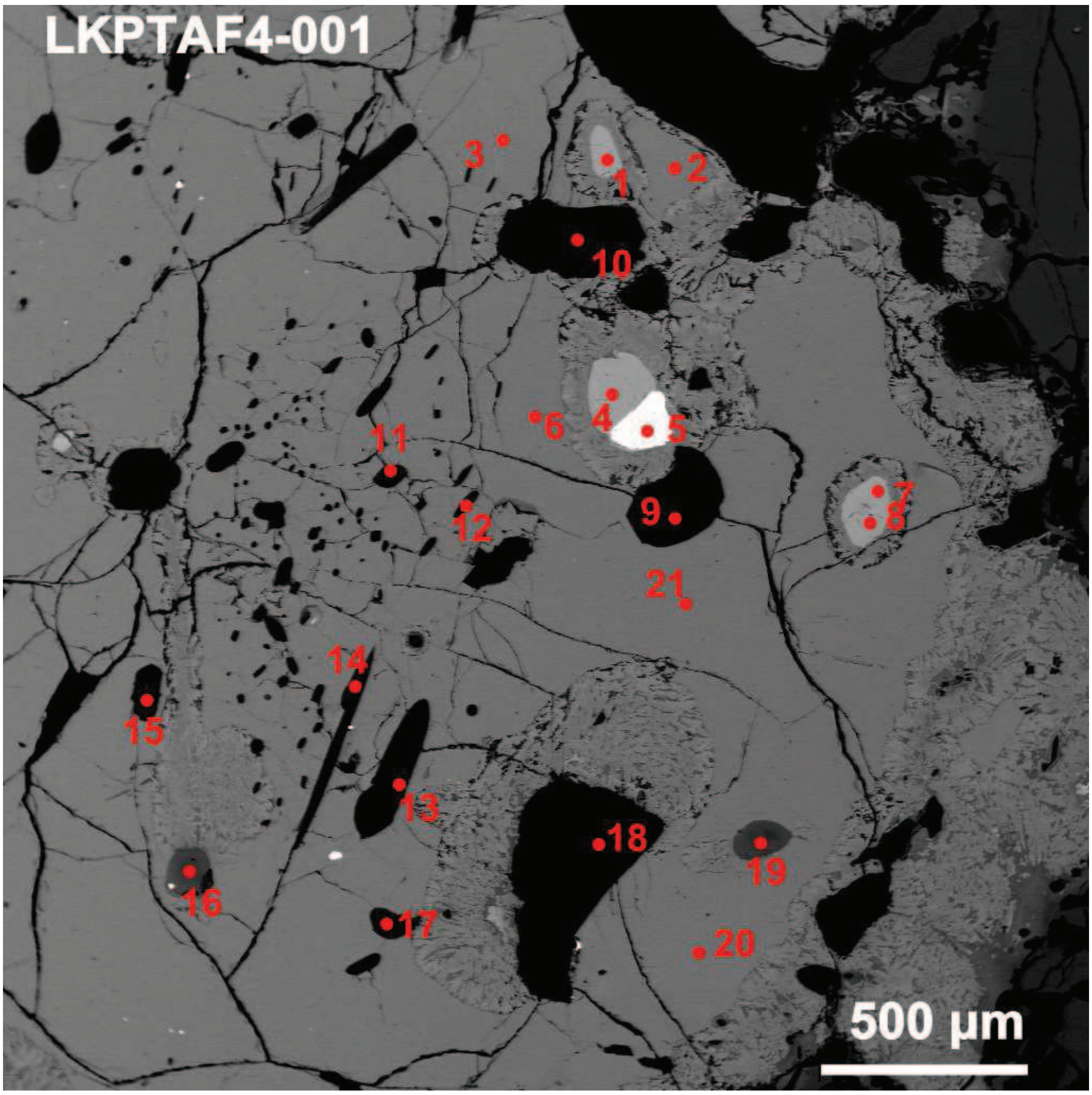

BG4-023
1
2
100 µm

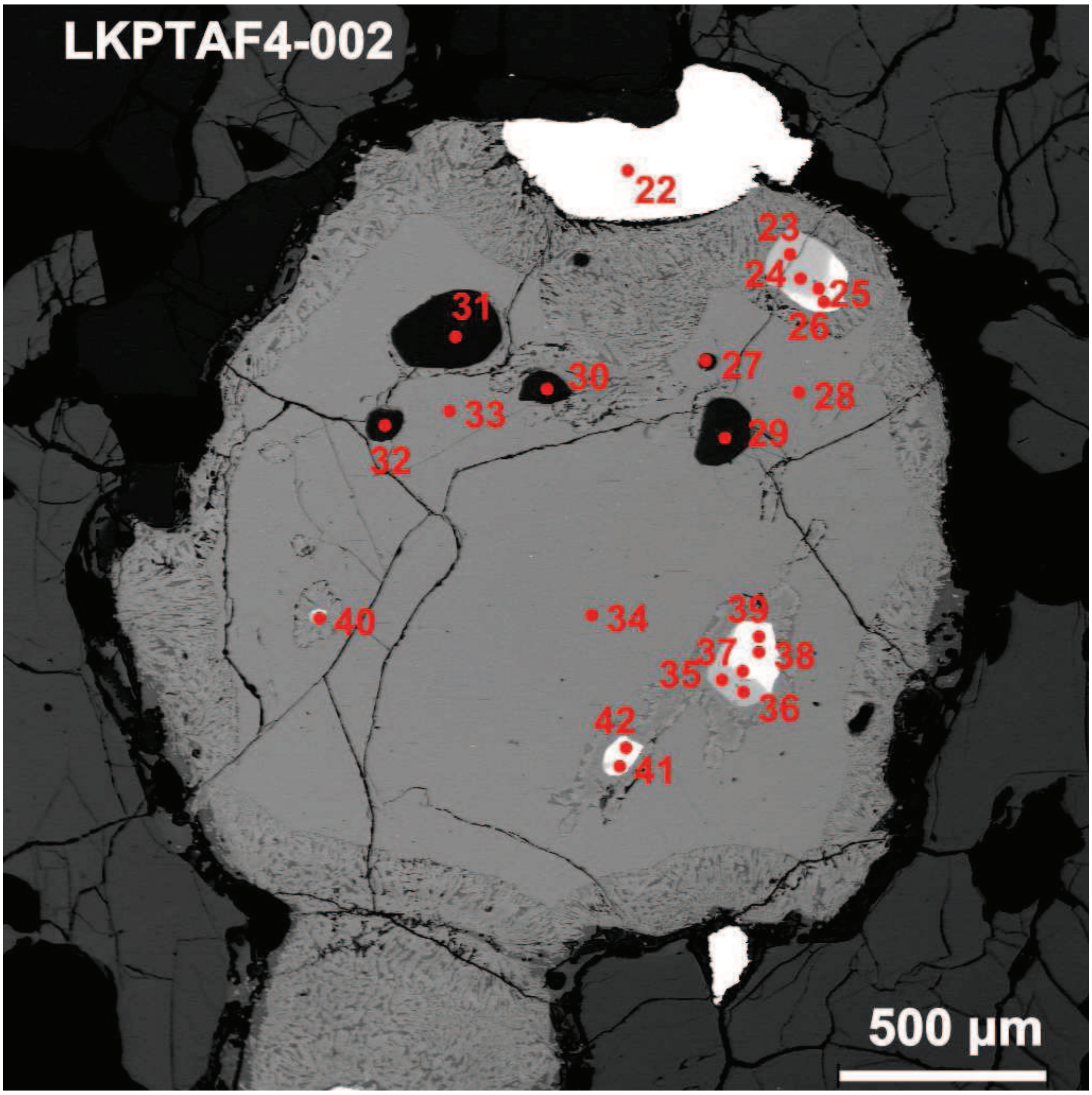
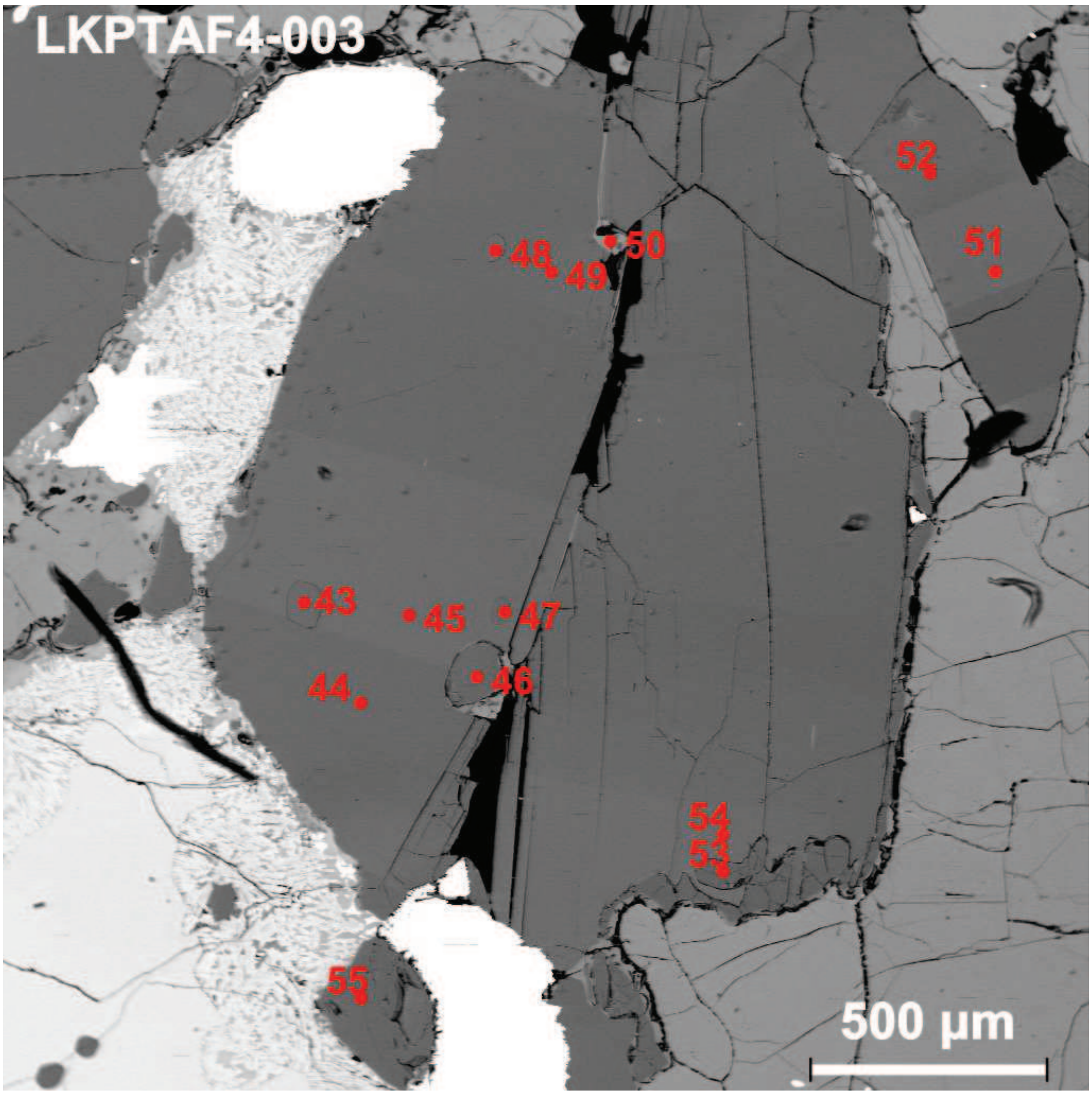

BG4-024
2
1
10 µm

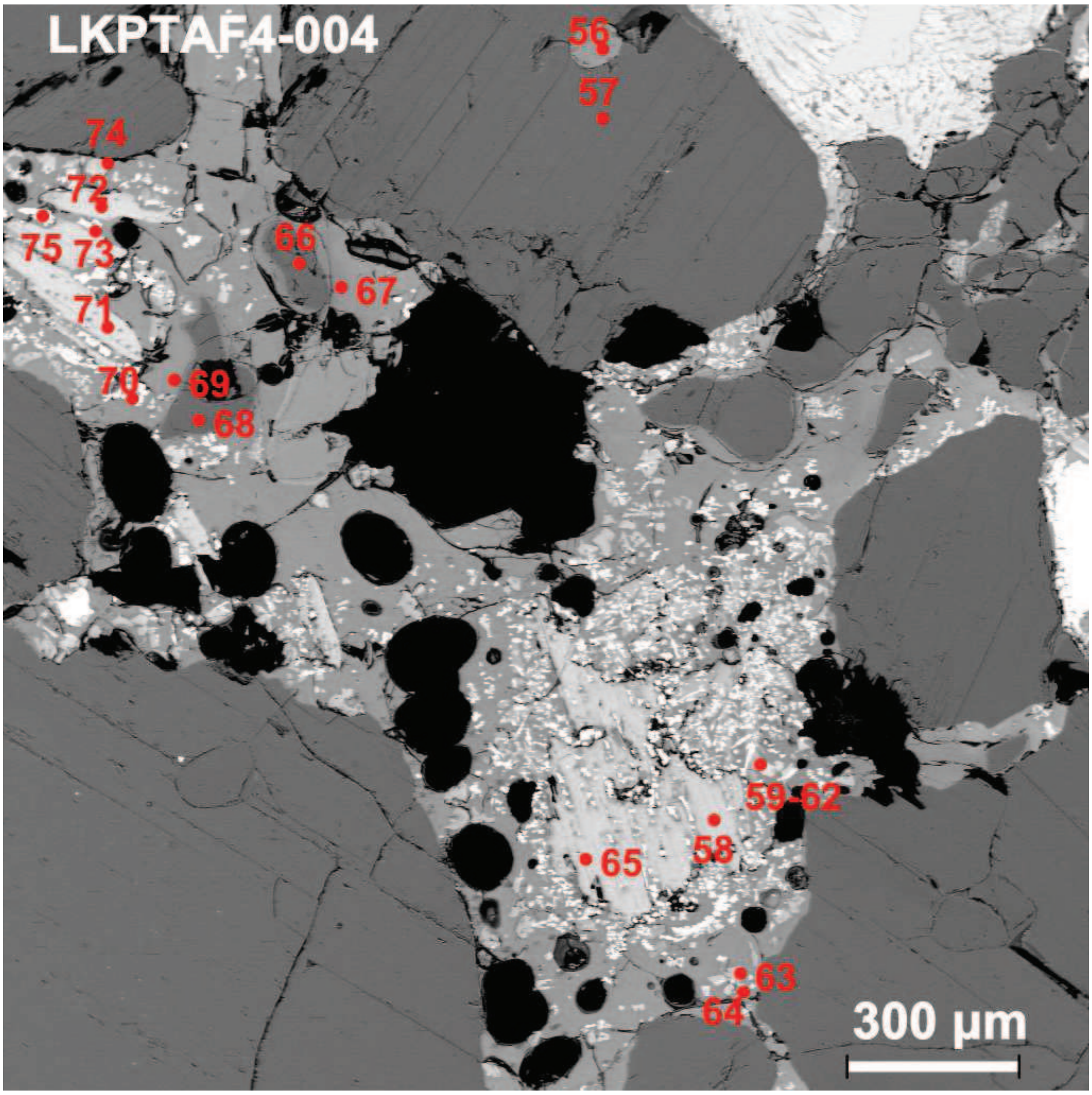

BG4-025
1
2
3
10 µm

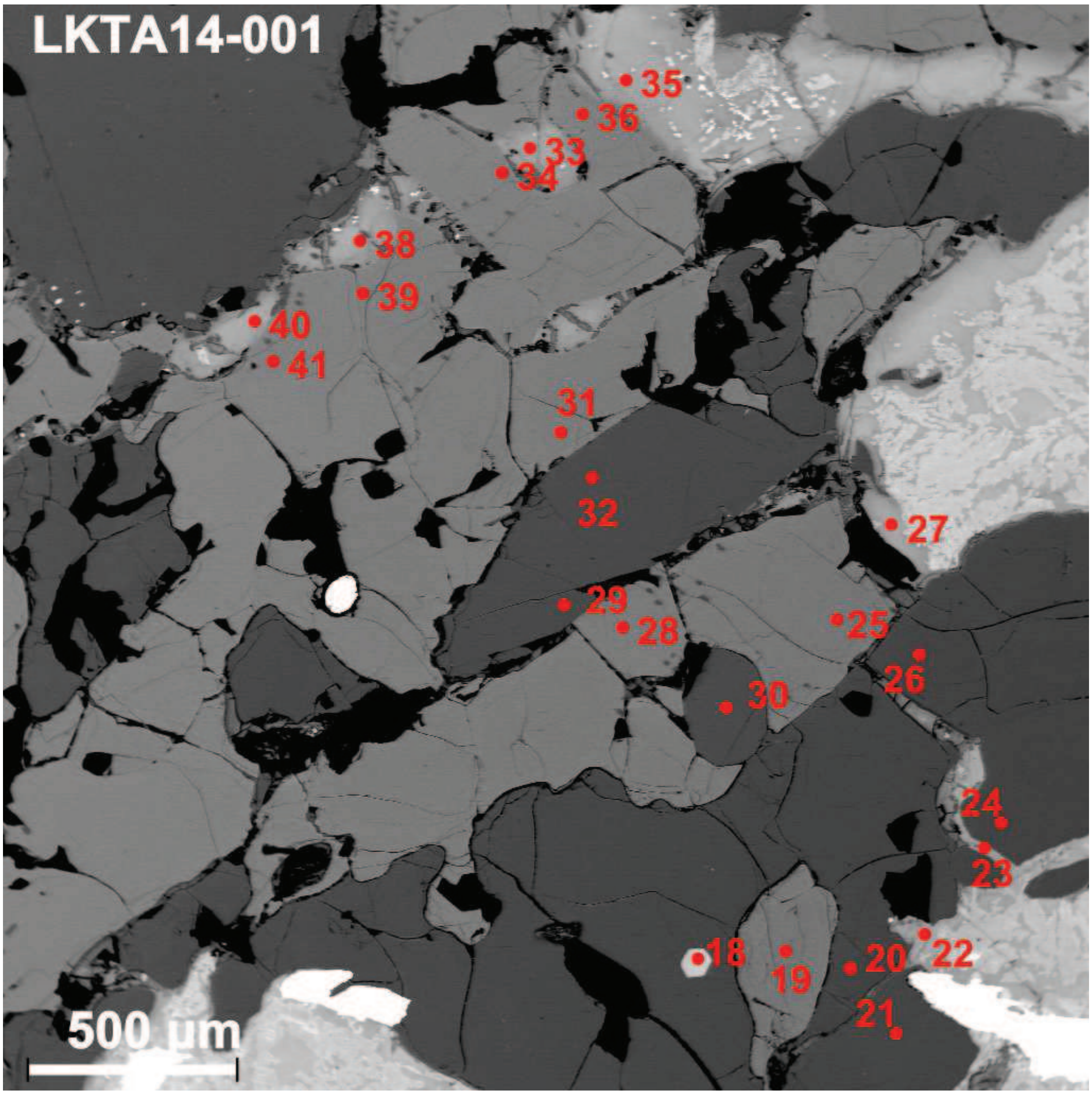

BG4B-001
1
2
3
100 µm

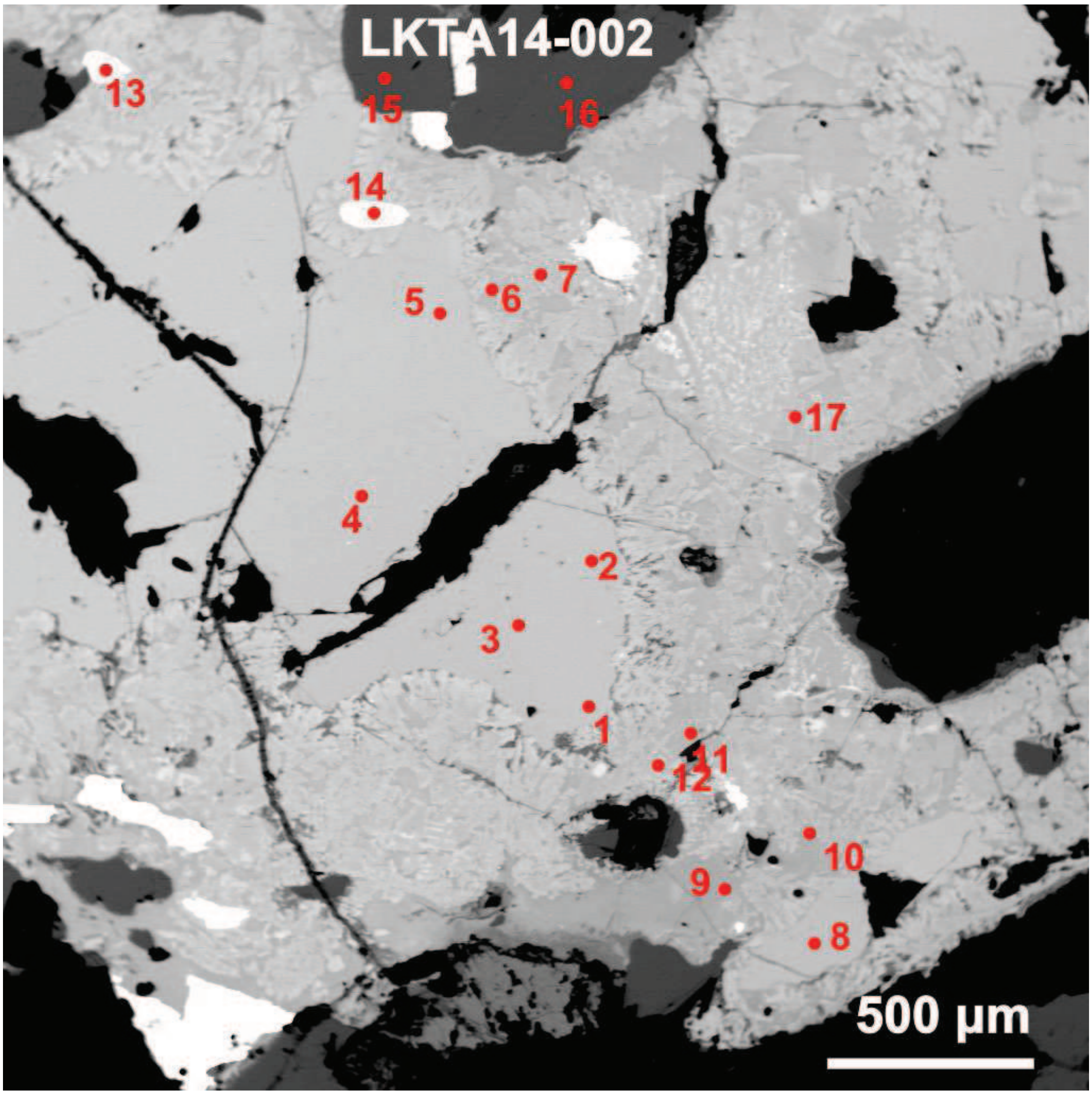

G4B-003
1
2
3
4
5
6
50 µm

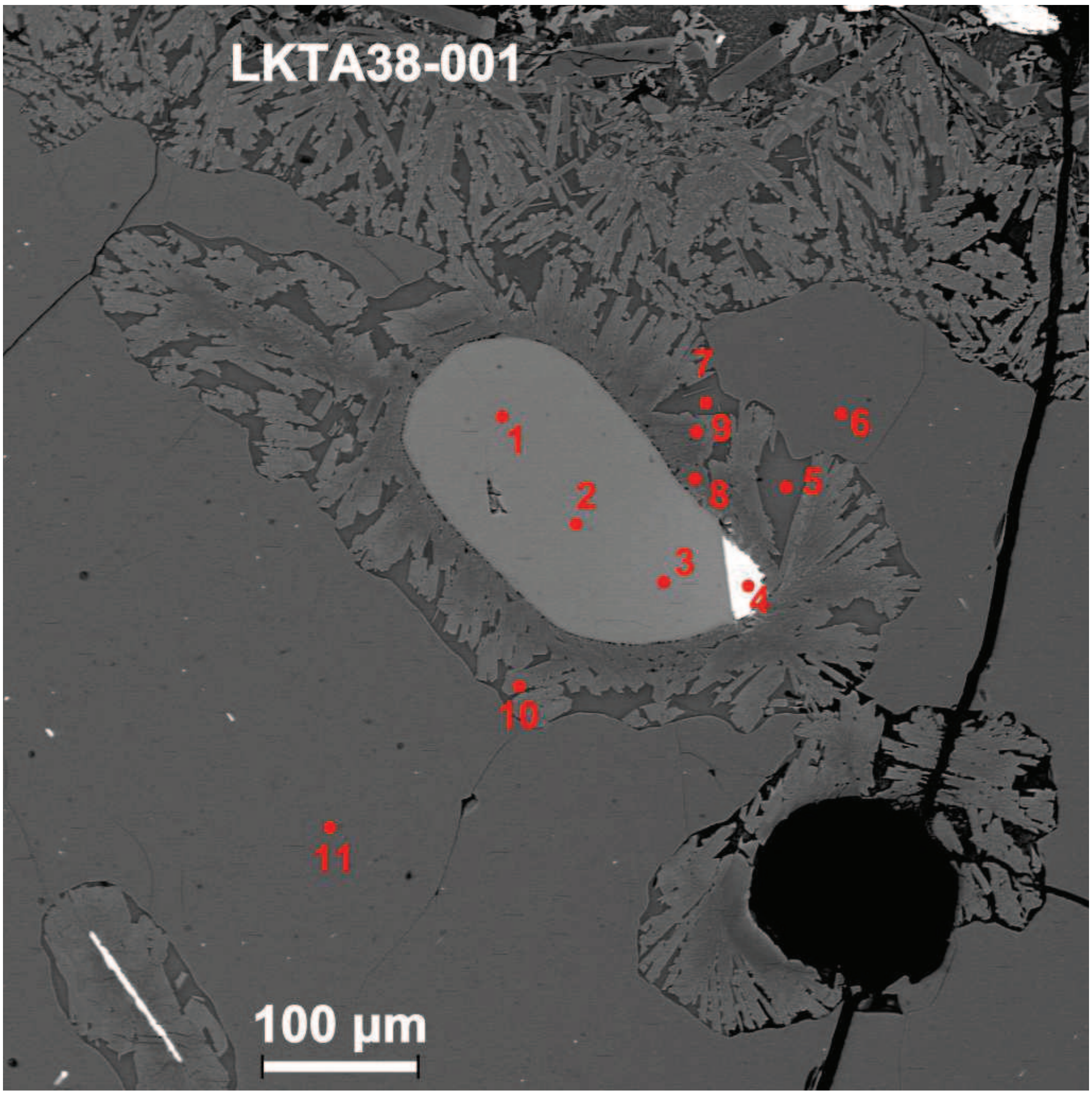

LKPTAF4-001
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
500 µm

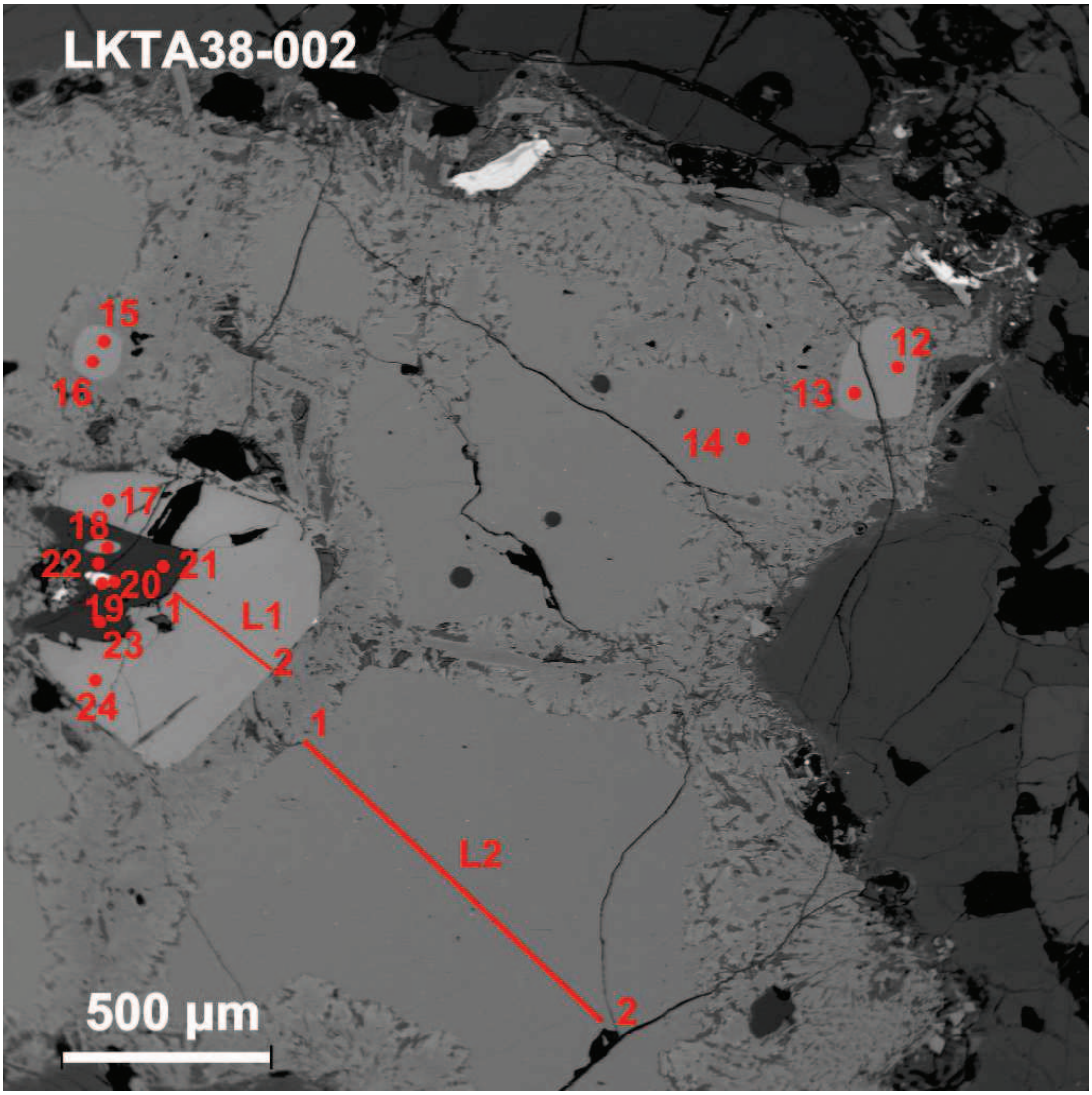

LKPTAF4-002
22
23
24
25
26
31
30
27
28
33
29
32
34
39
40
37
38
35
36
42
41
500 µm

LKPTAF4-003
52
51
48
49
50
43
45
47
44
46
54
53
55
500 µm

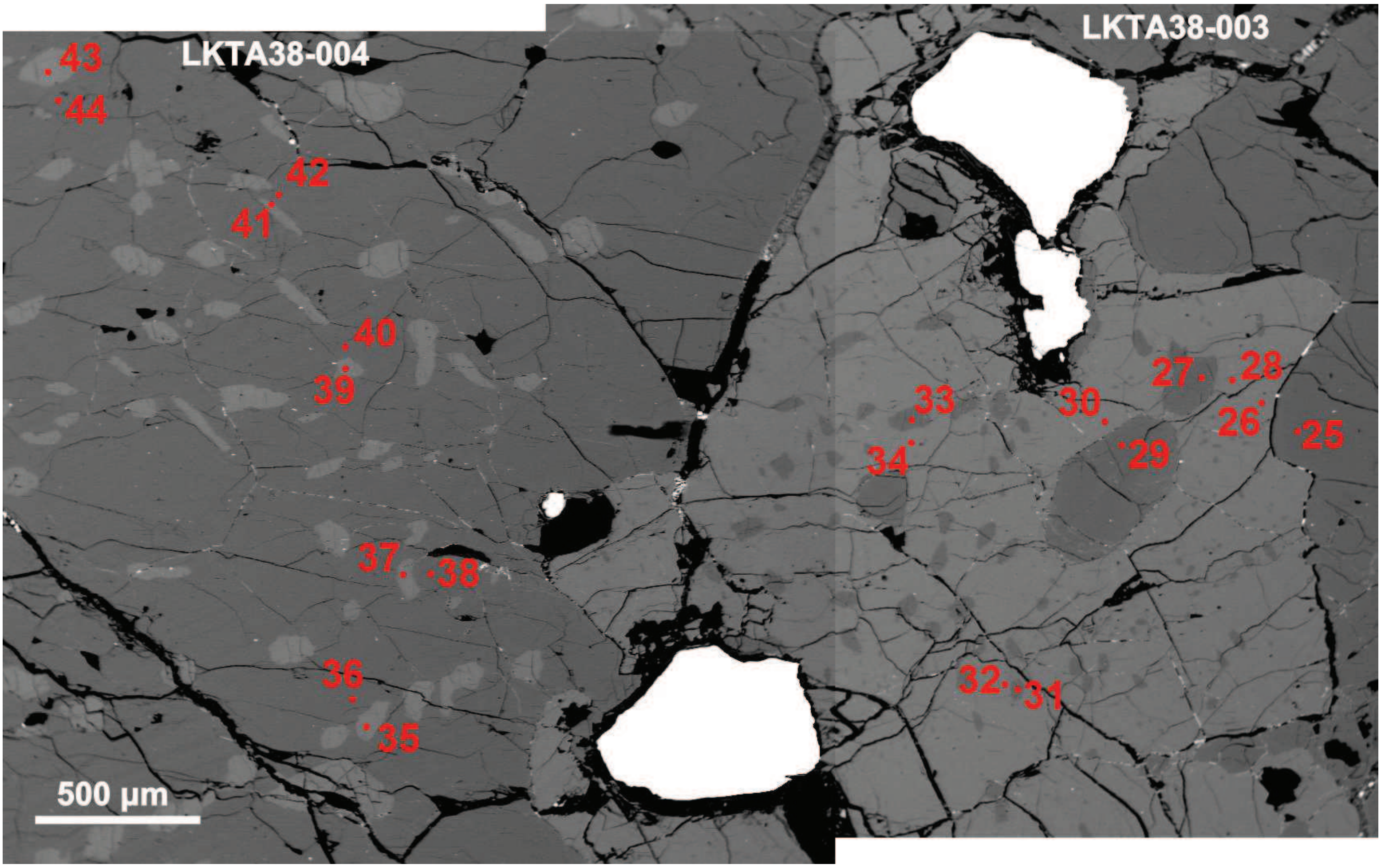

LKPTAF4-004
56
57
74
72
75
73
66
67
71
70
69
68
59-62
58
65
63
64
300 µm

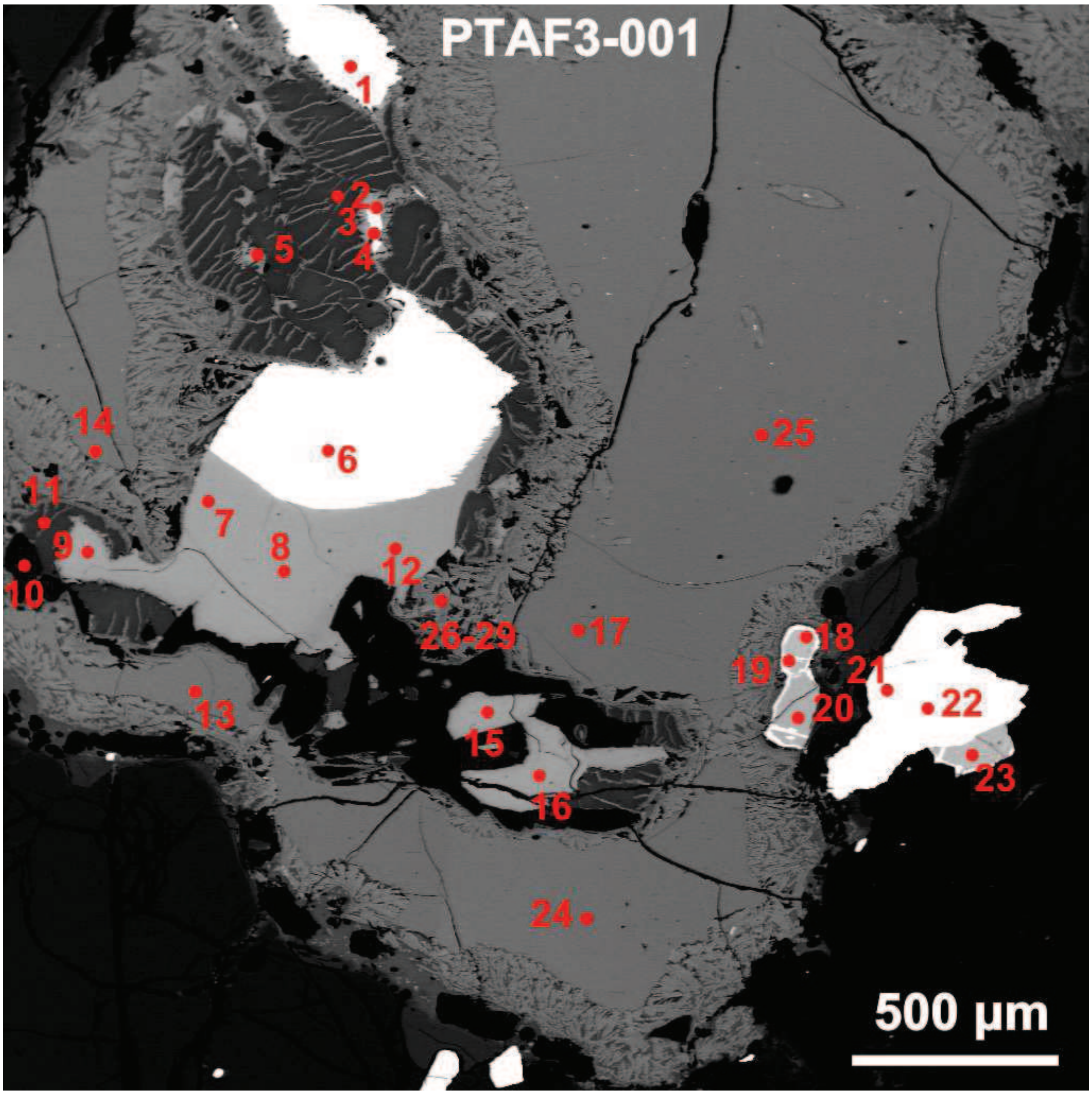

LKTA14-001
35
36
33
34
38
39
40
41
31
32
27
29
28
25
26
30
24
23
22
18
19
20
21
500 µm

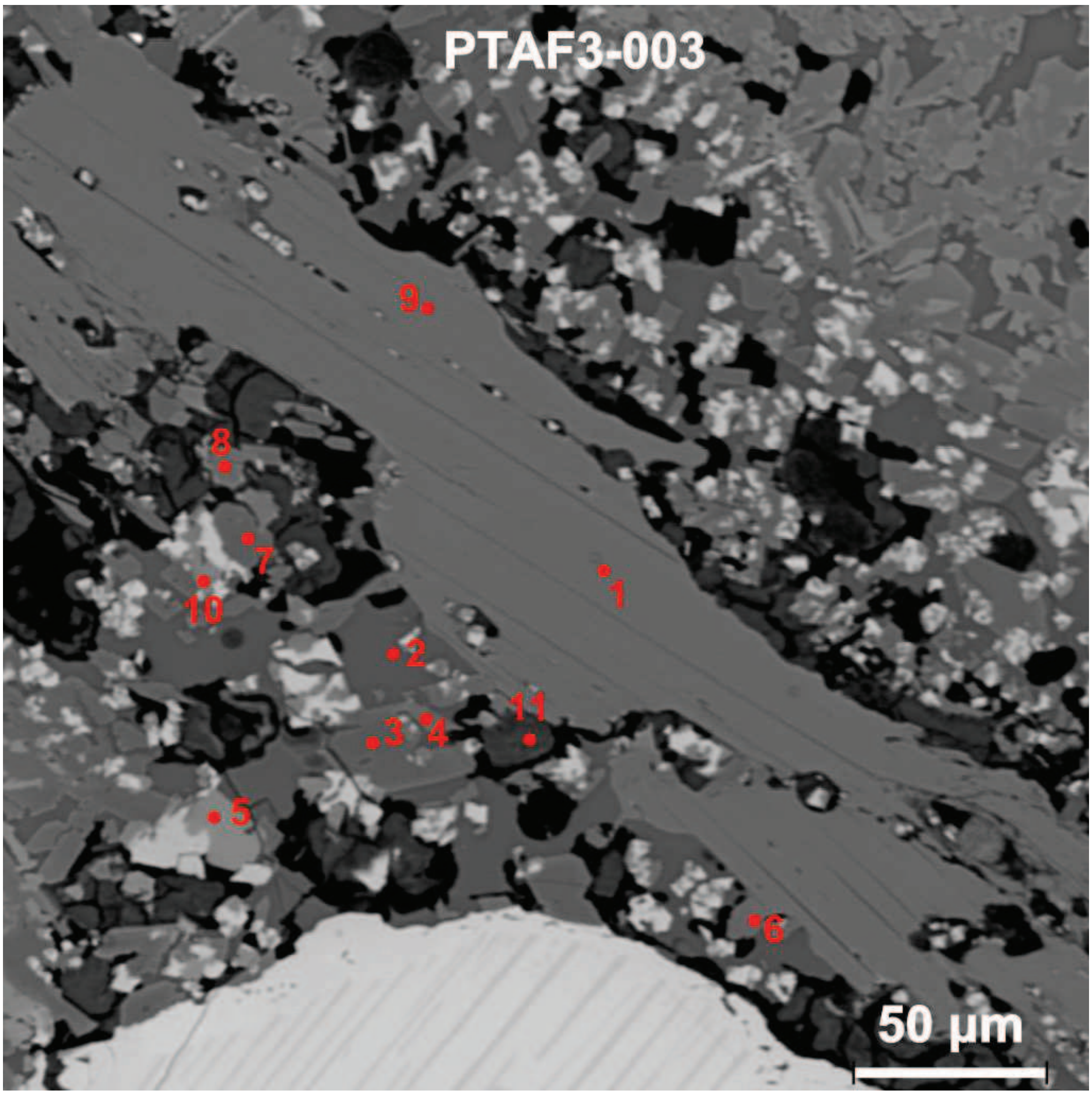

LKTA14-002
13
15
16
14
7
5
6
17
4
2
3
1
11
12
10
9
8
500 µm

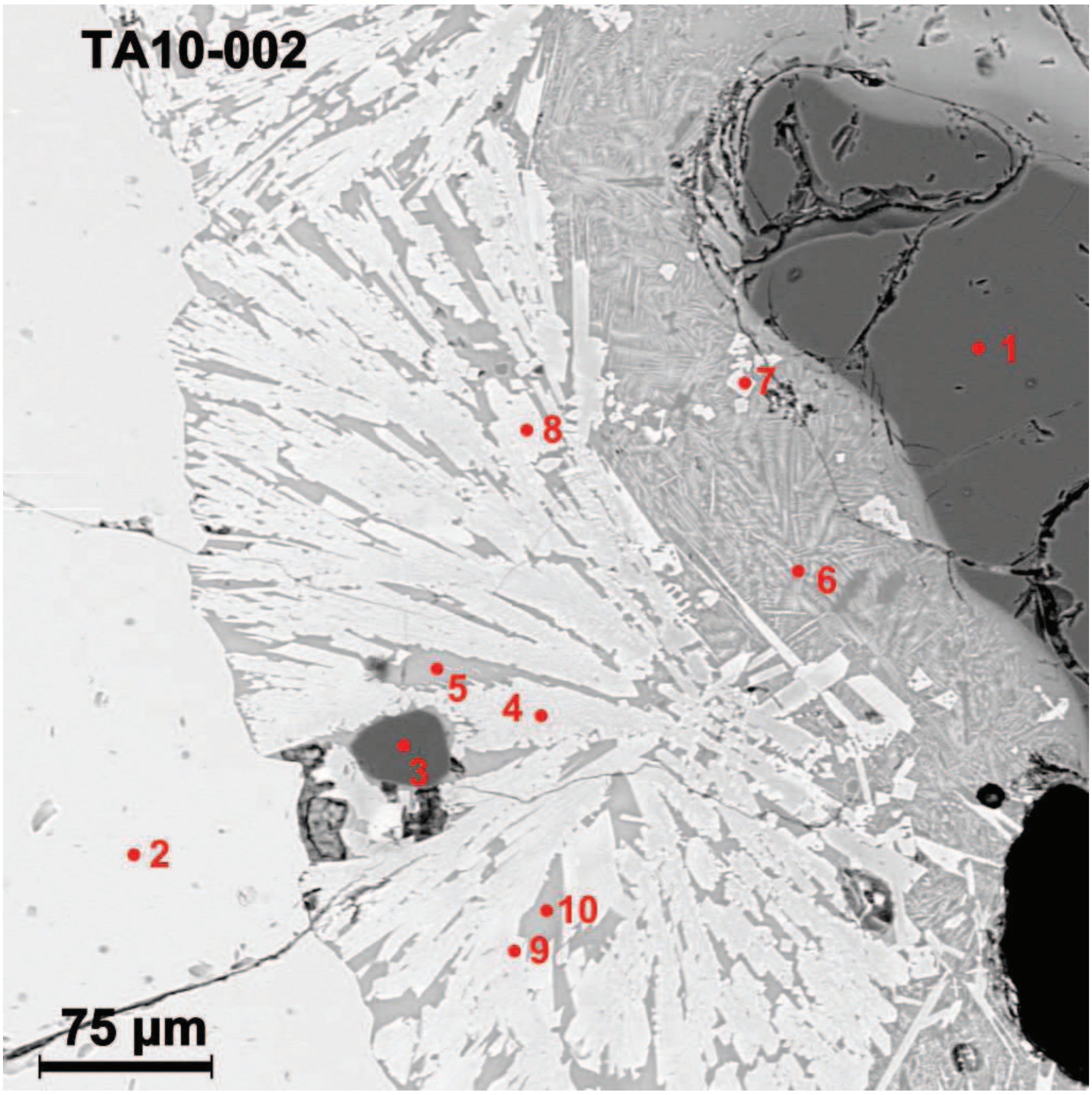

LKTA38-001
7
1
9
6
8
5
2
3
4
10
11
100 µm

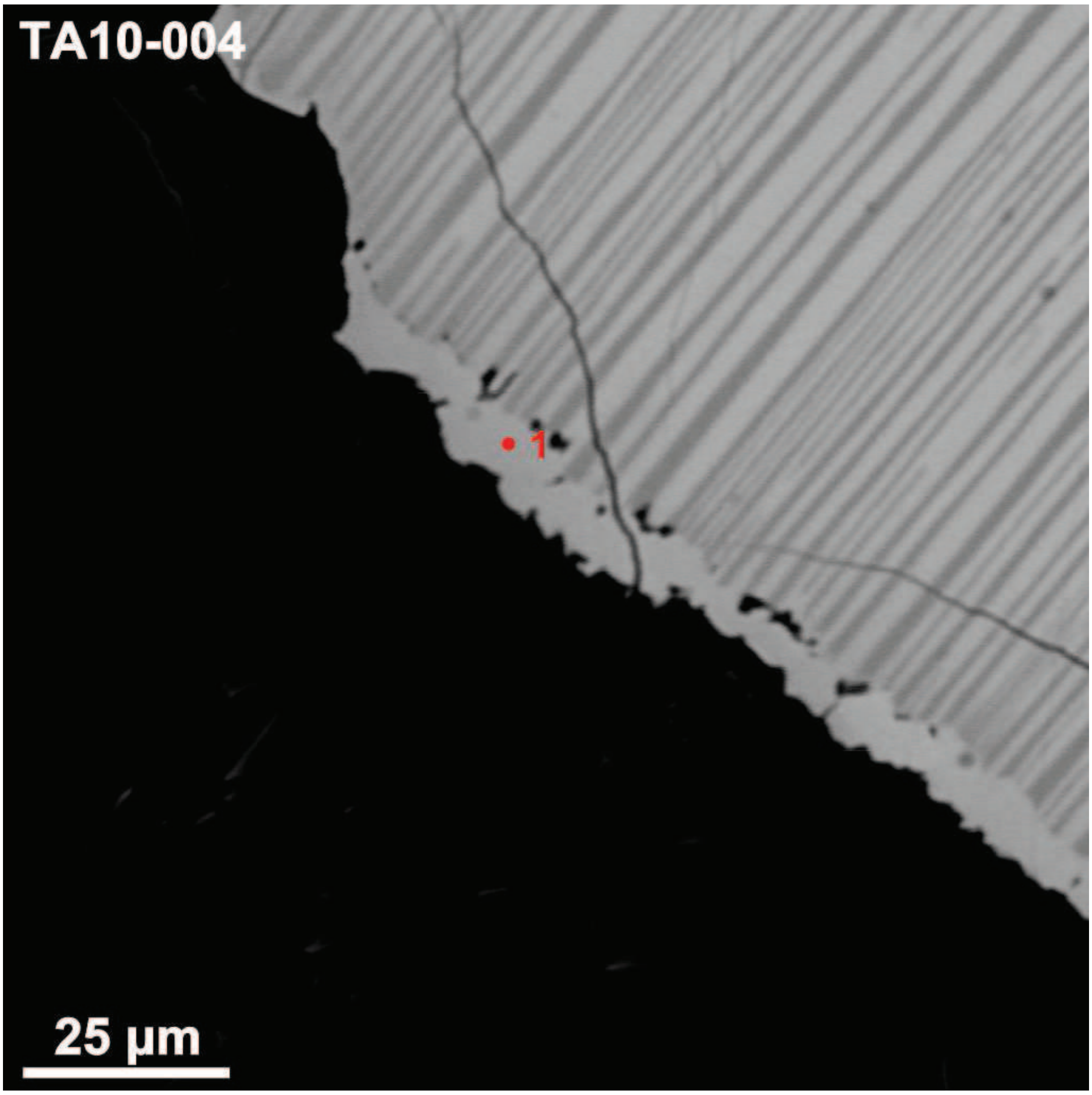

LKTA38-002
15
16
12
13
14
17
18
22
21
20
19
1
L1
2
23
24
1
L2
2
500 µm

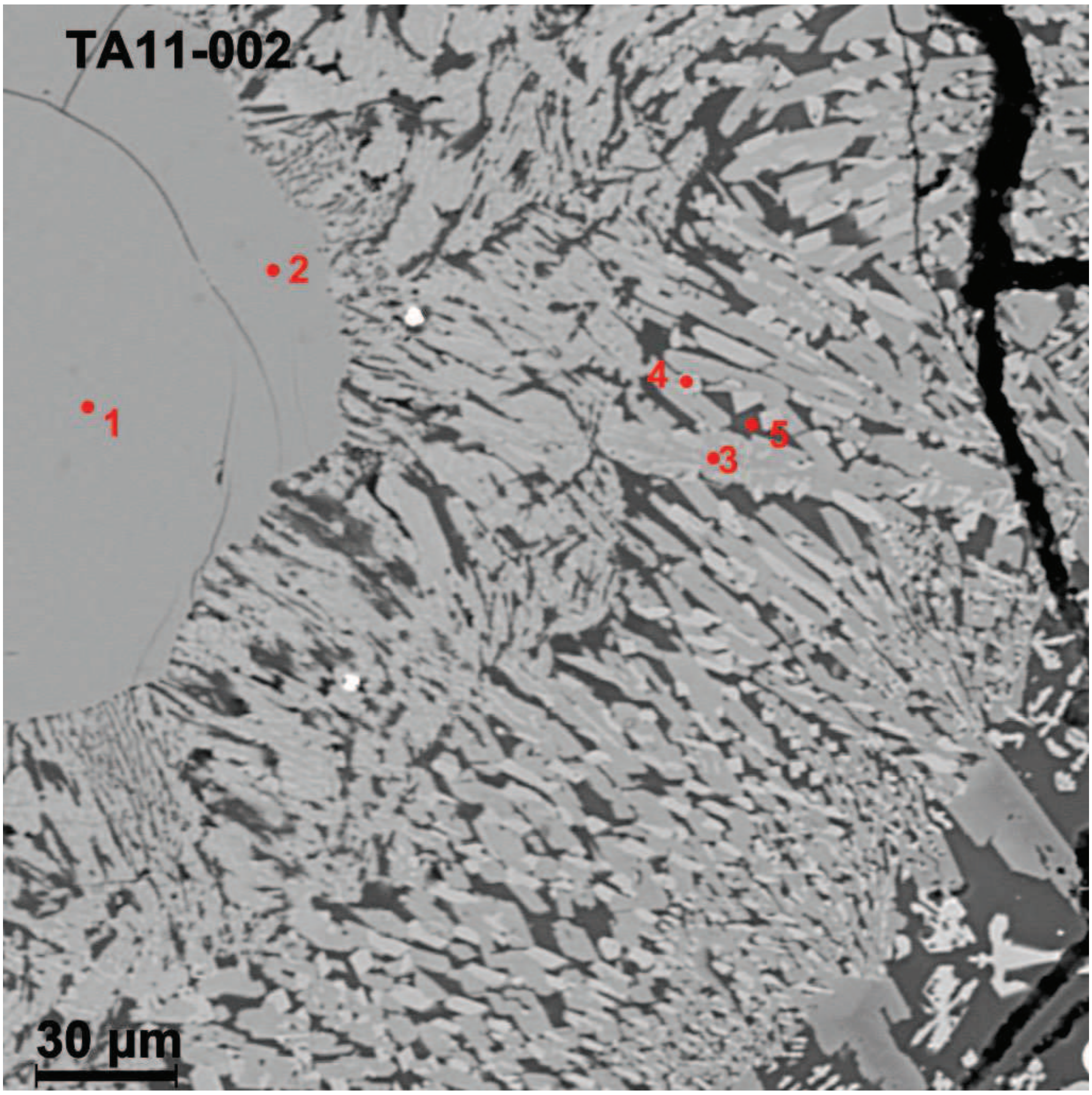

LKTA38-004
LKTA38-003
43
44
42
41
40
39
33
30
27
28
26
25
34
29
37
38
36
35
32
31
500 µm

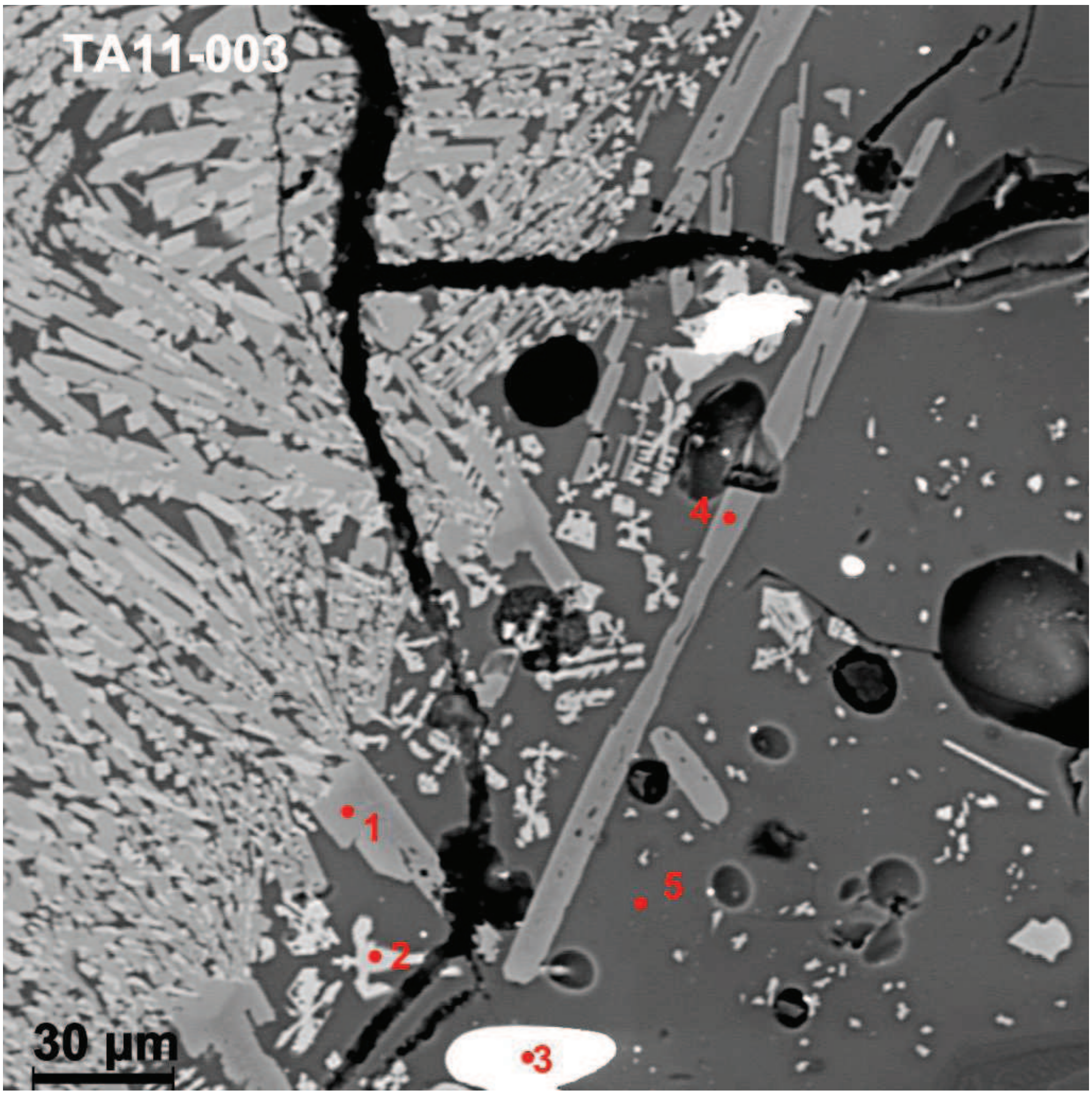

PTAF3-001
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26-29
500 µm

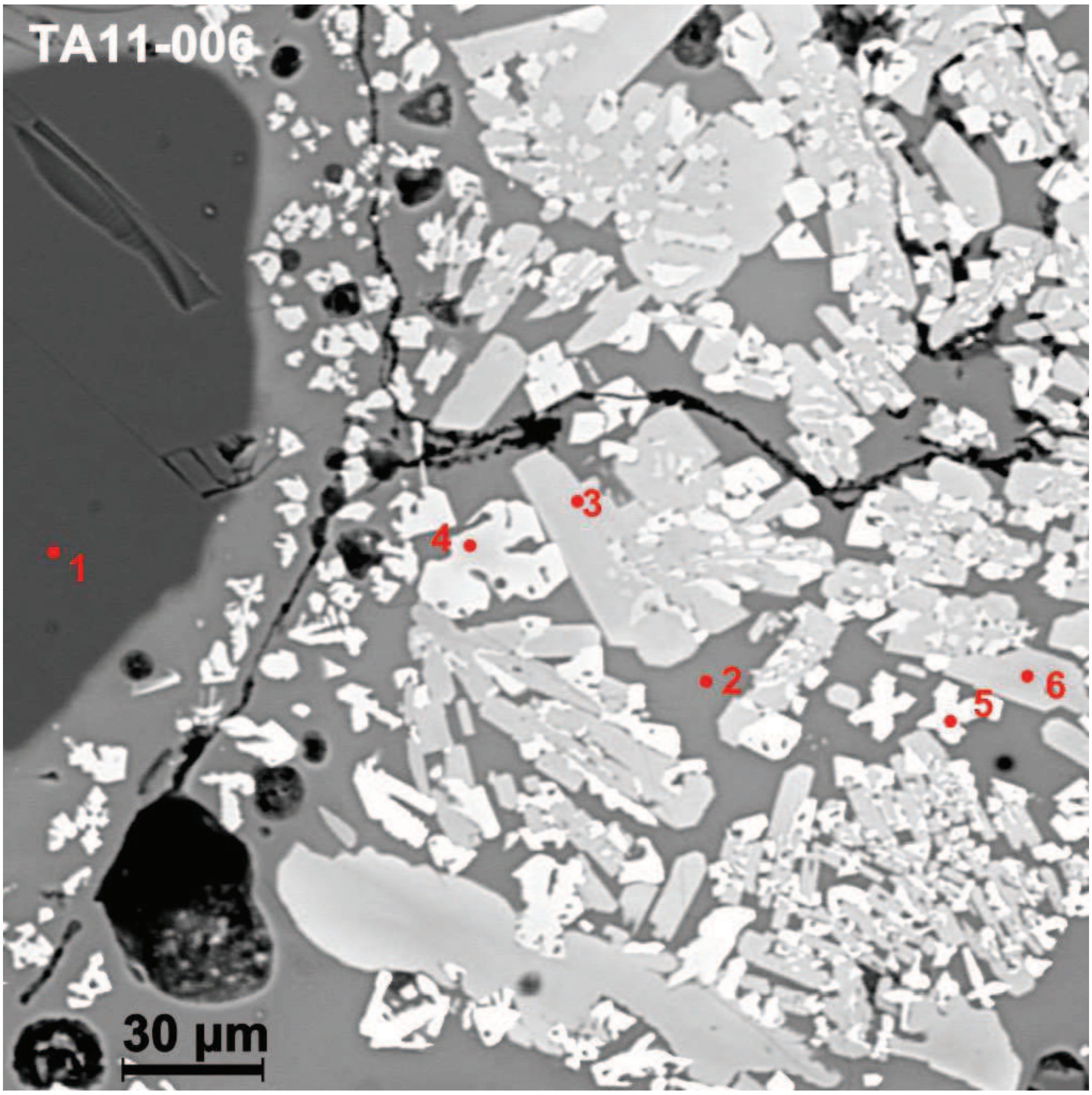

PTAF3-003
1
2
3
4
5
6
7
8
9
10
11
50 µm

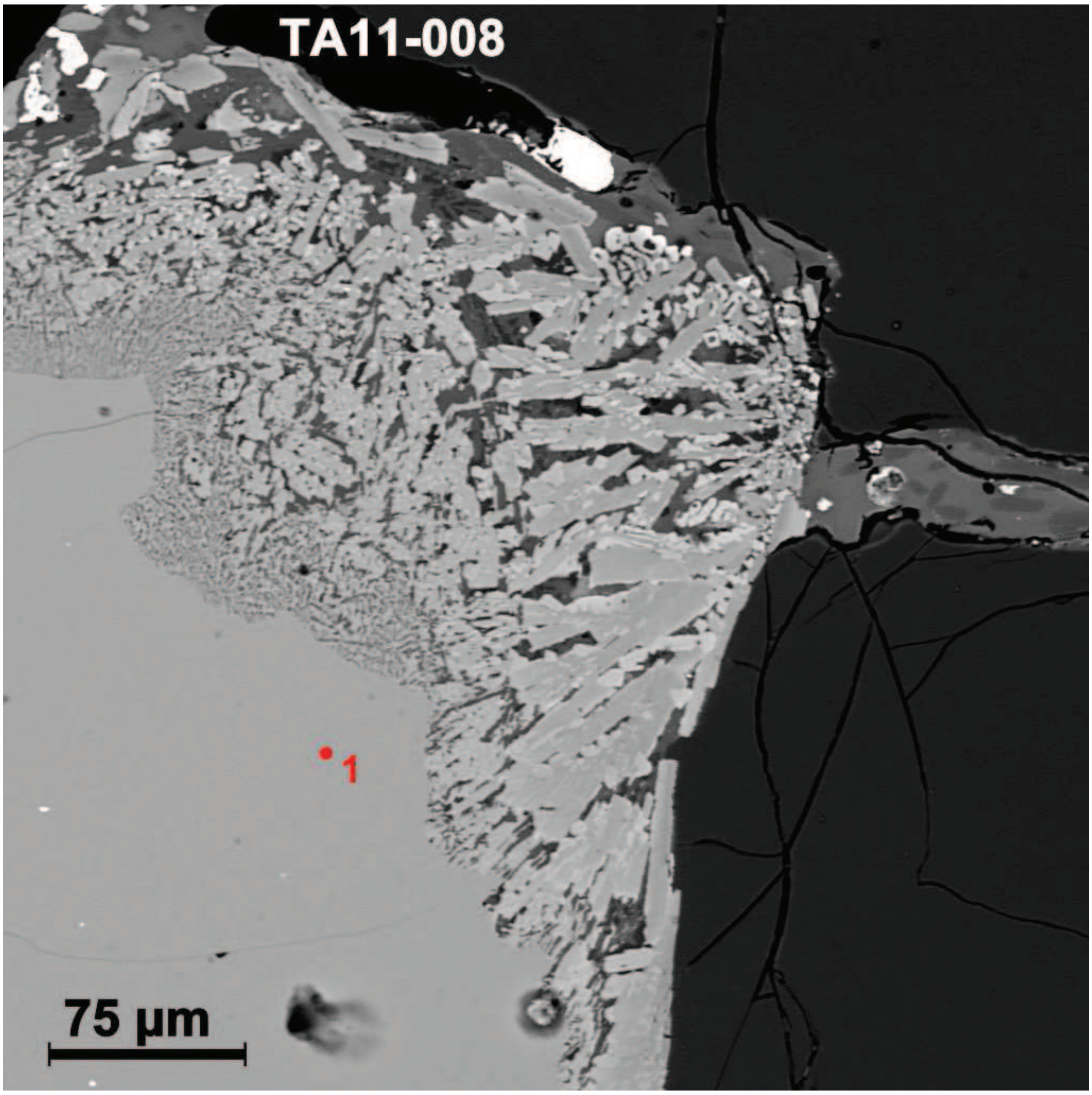

TA10-002
1
2
3
4
5
6
7
8
9
10
75 µm

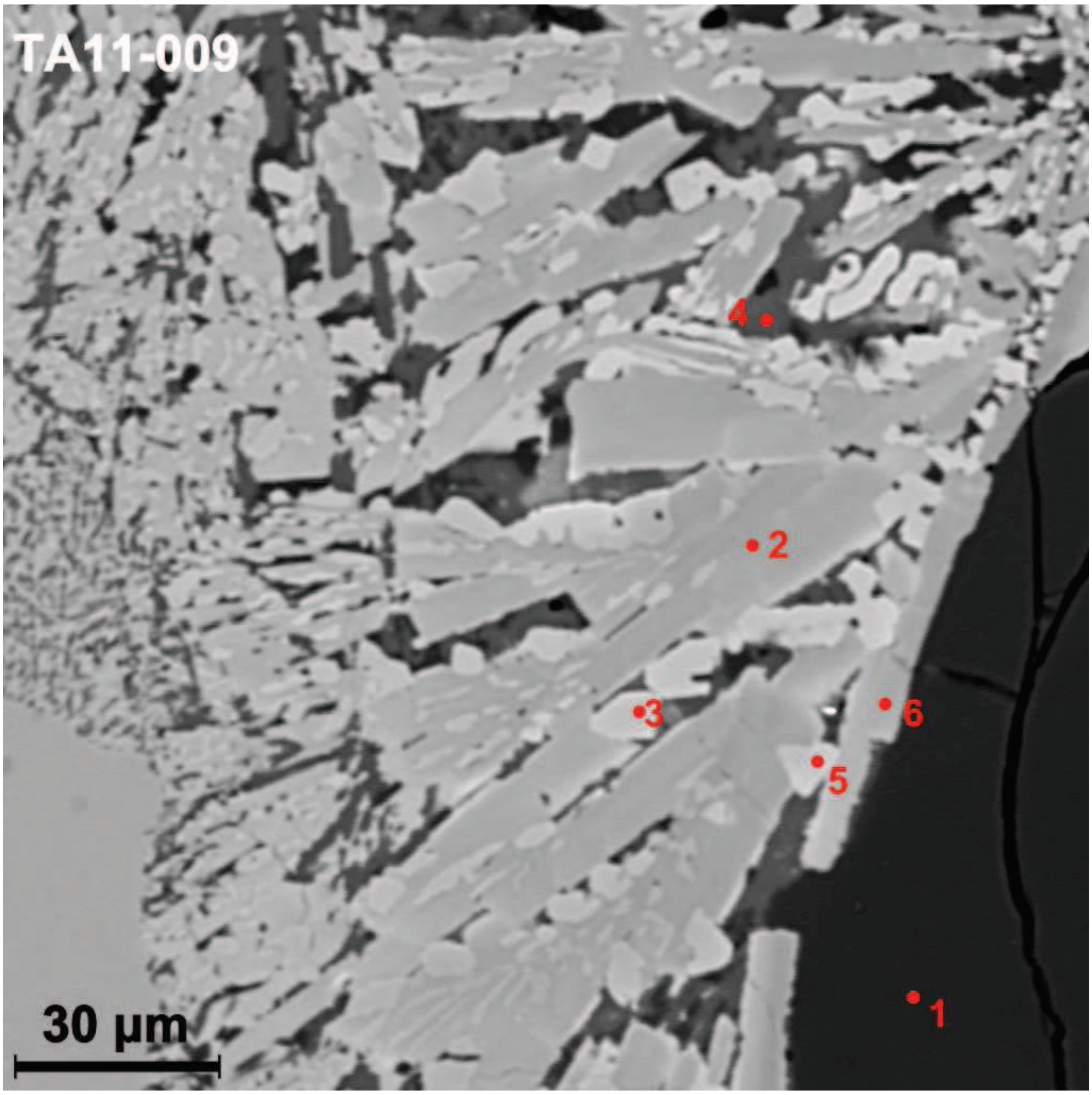

TA10-004
1
25 µm

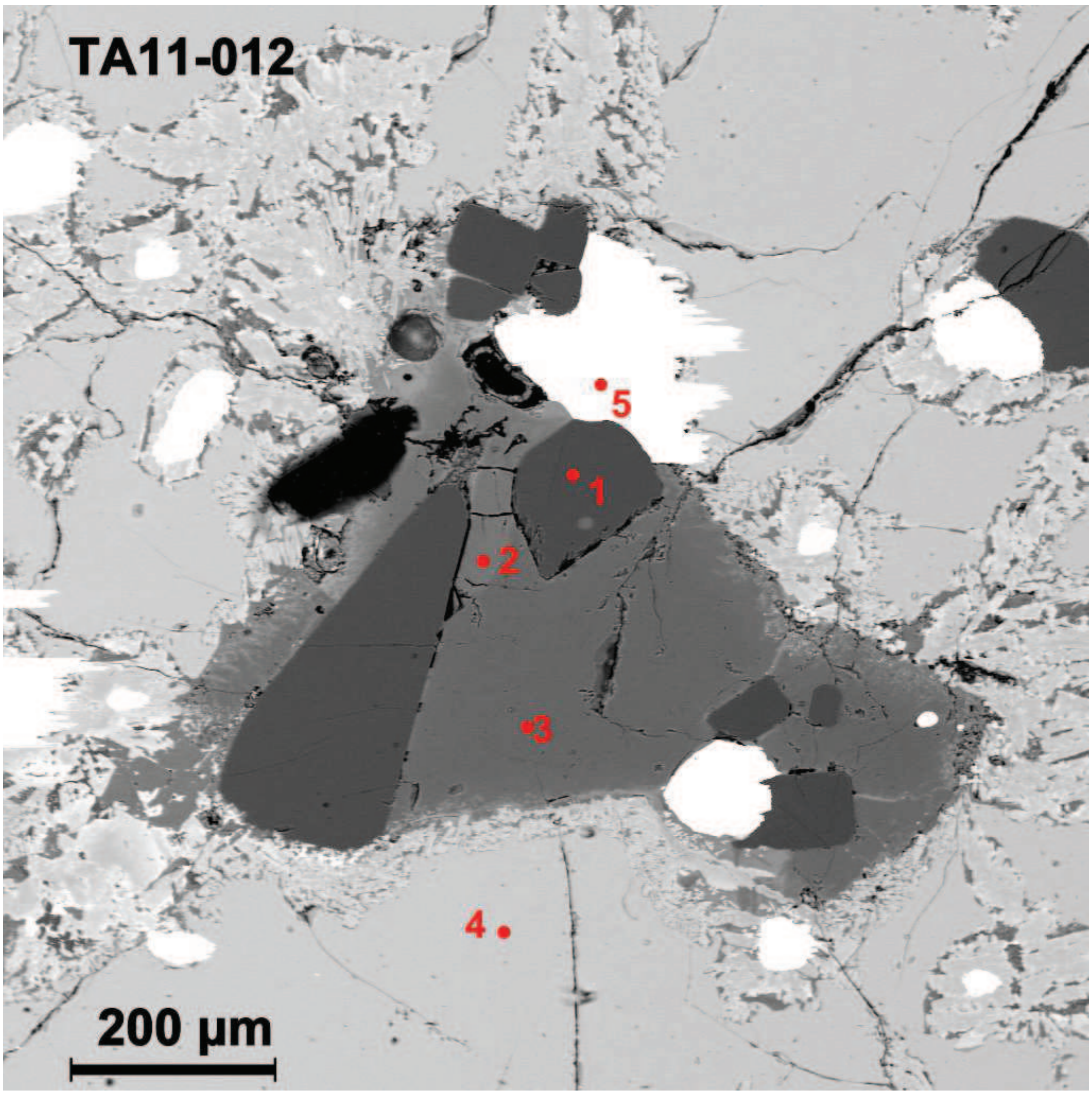

TA11-002
1
2
3
4
5
30 µm

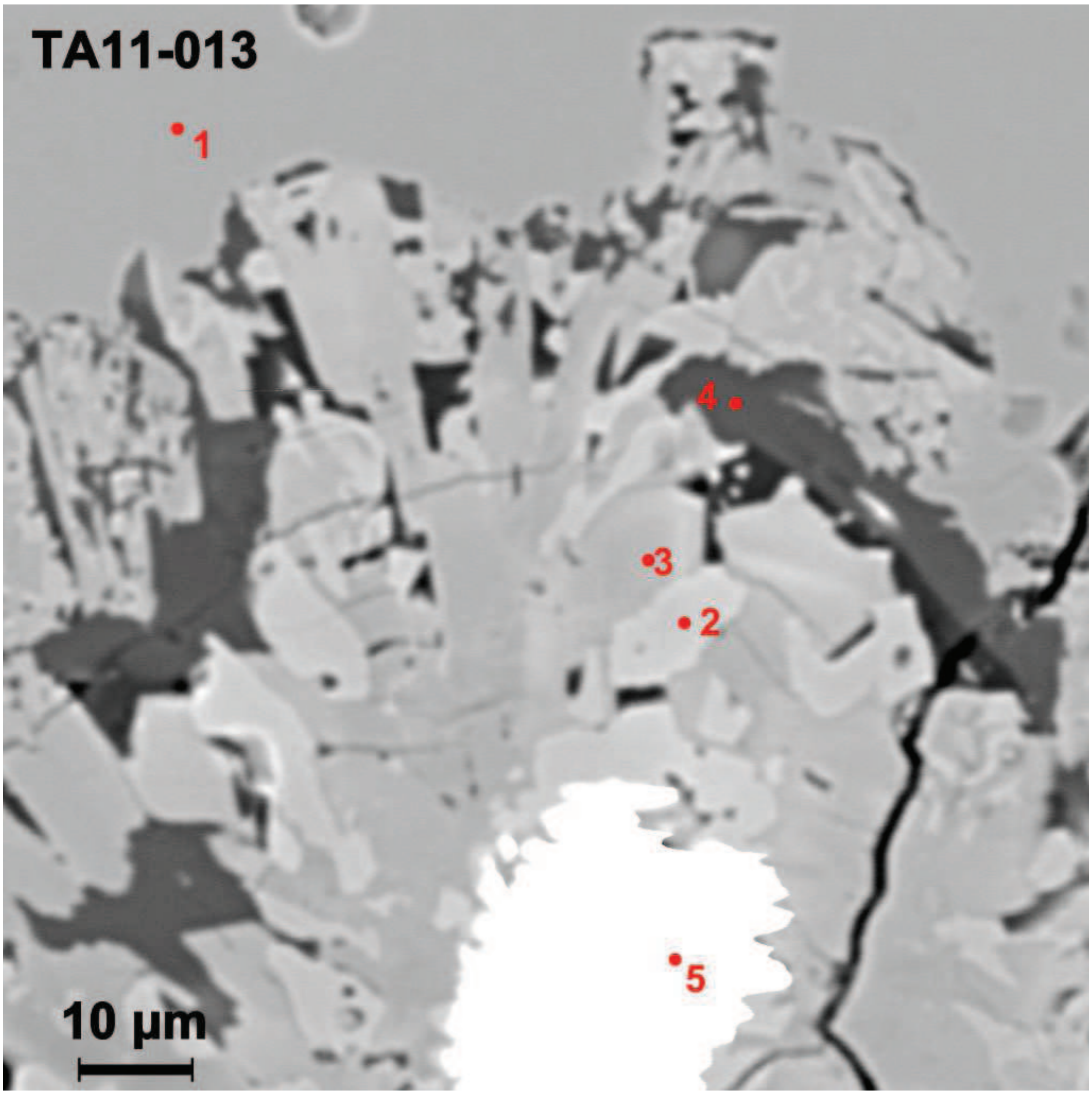

TA11-003
1
2
3
4
5
30 µm

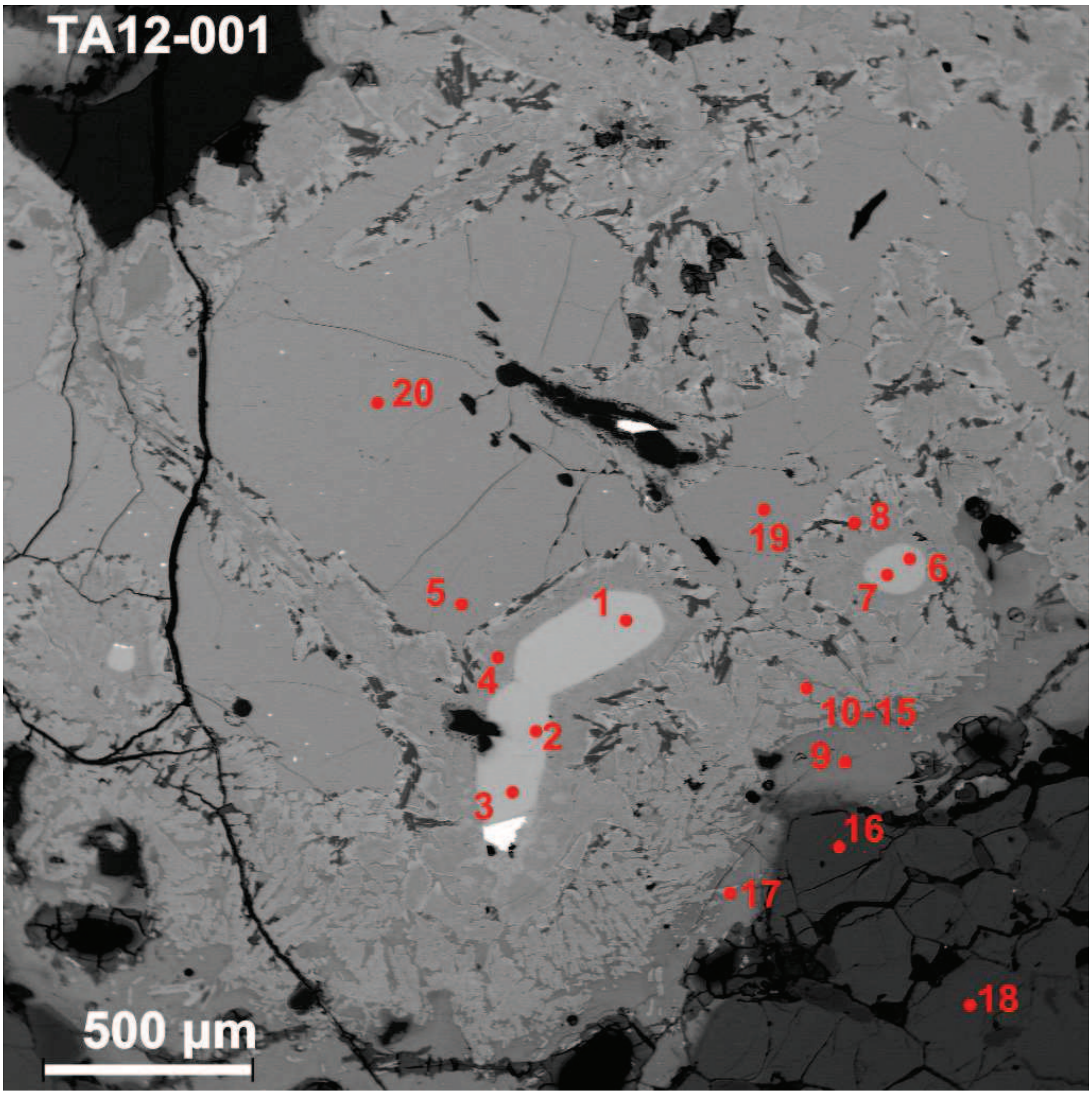

TA11-006
1
2
3
4
5
6
30 µm

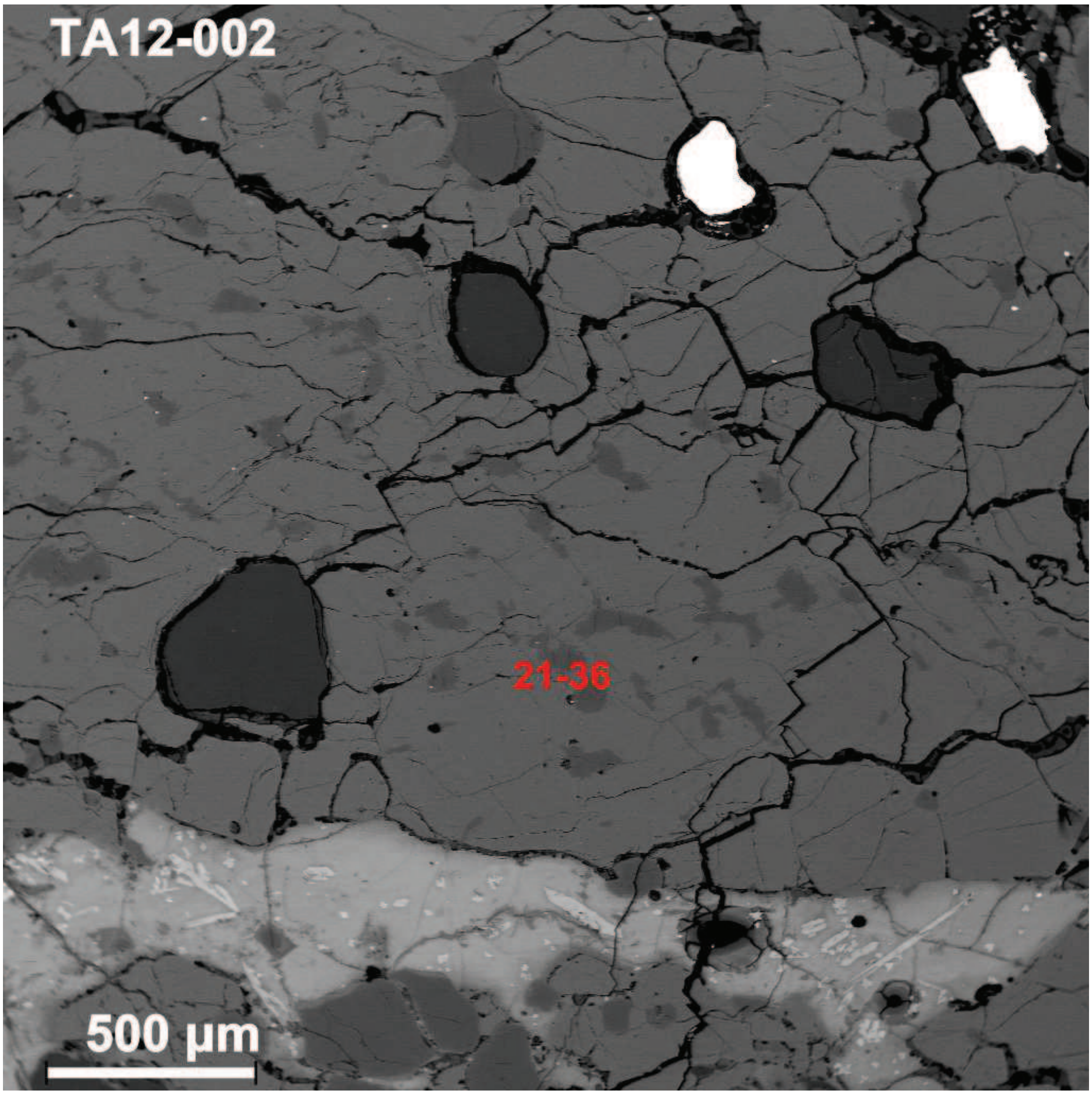

TA11-008
1
75 µm

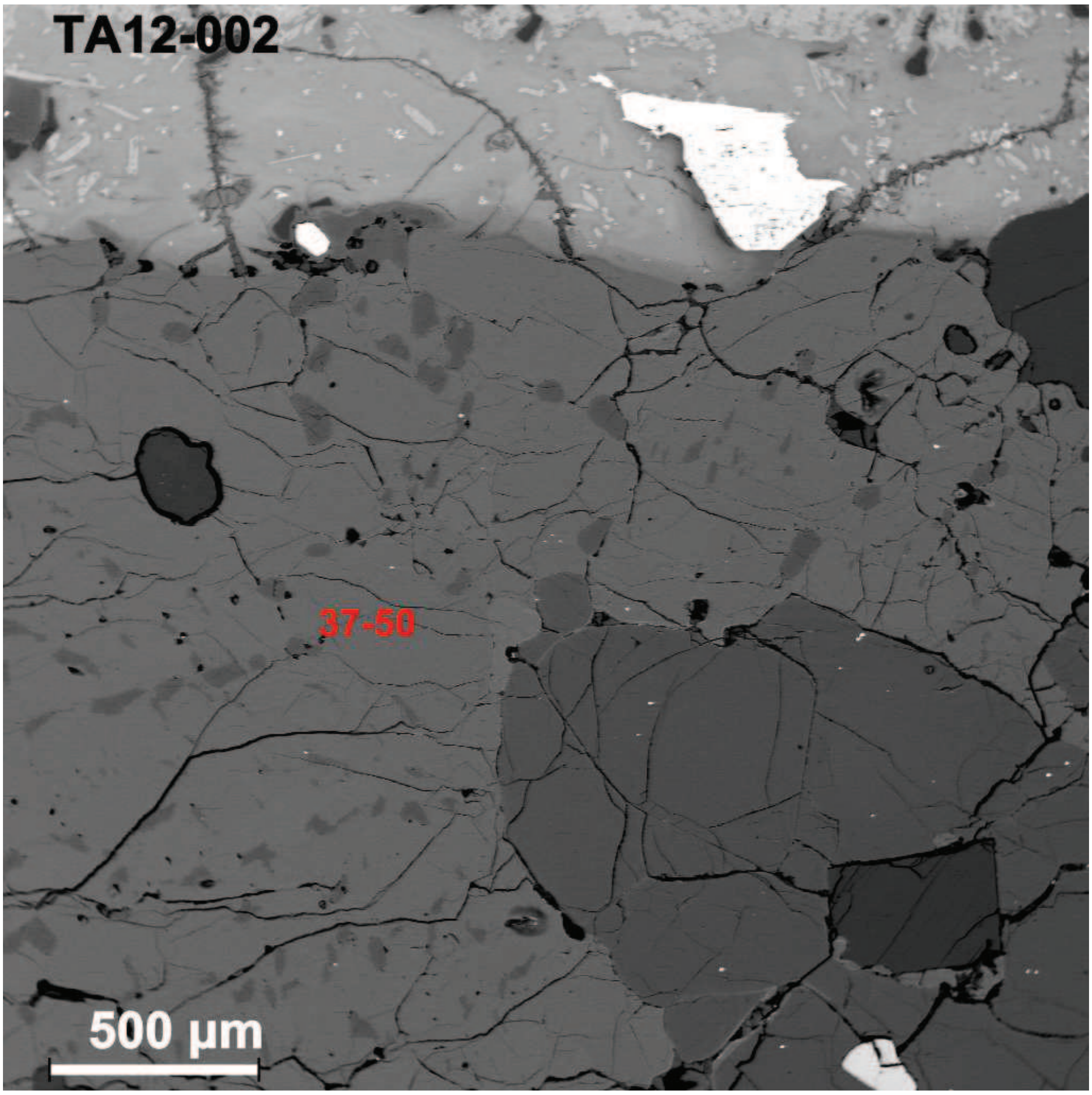

TA11-009
4
2
3
6
5
1
30 µm

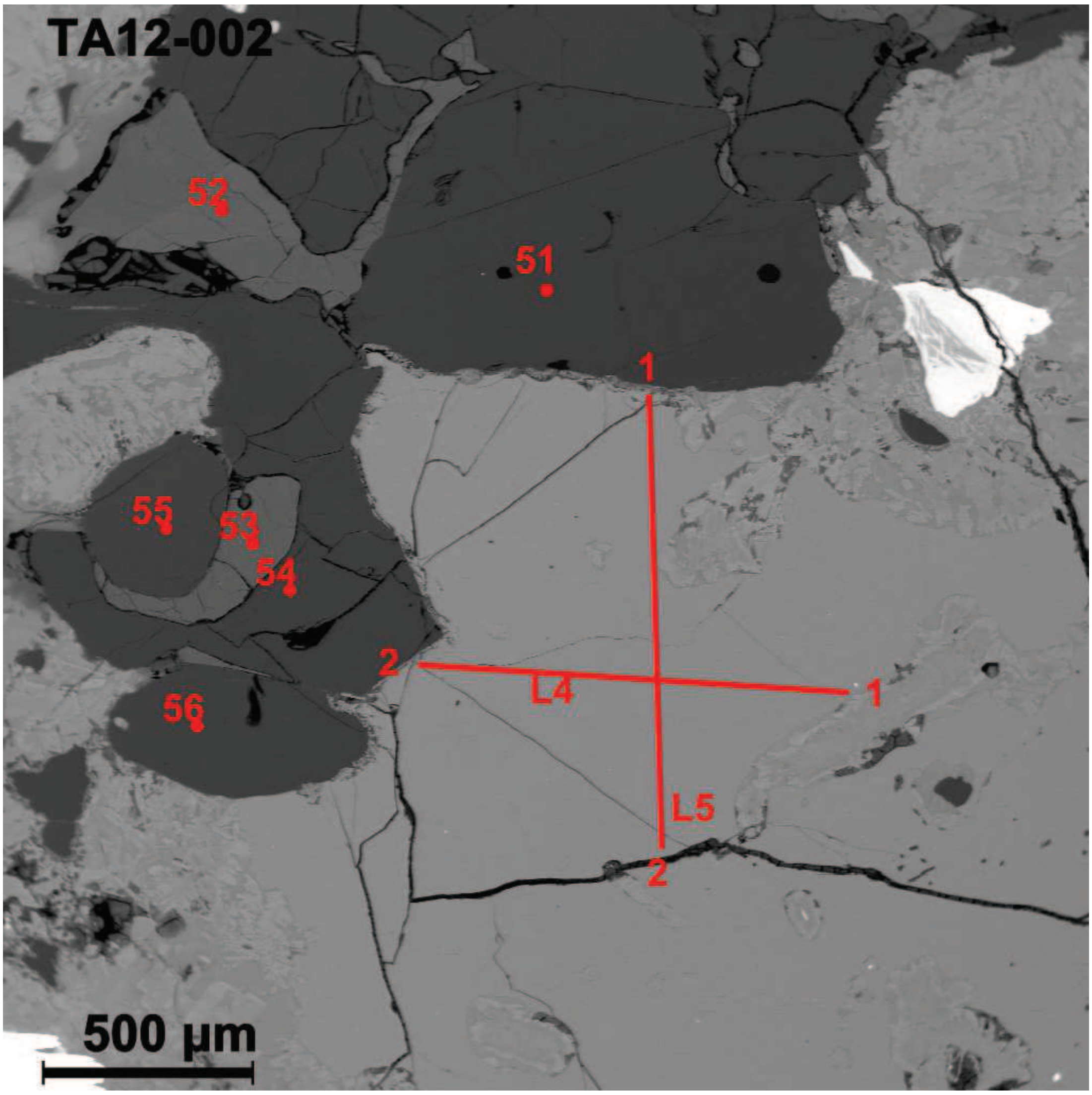

TA11-012
5
1
2
3
4
200 µm


TA11-013
1
4
3
2
5
10 µm

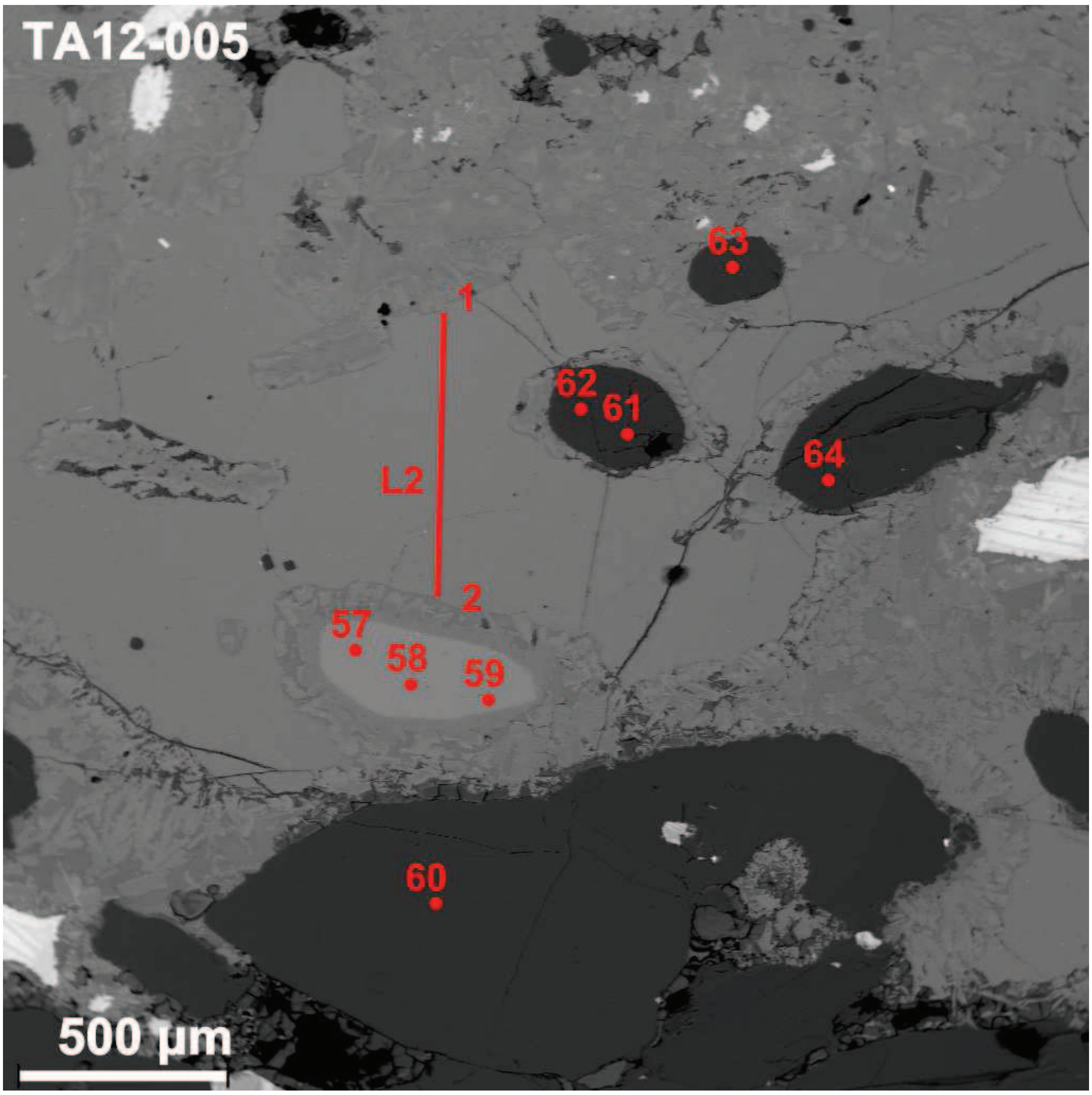

TA12-001
20
19
8
6
7
5
1
4
10-15
2
9
3
16
17
18
500 µm


TA12-002
21-36
500 µm

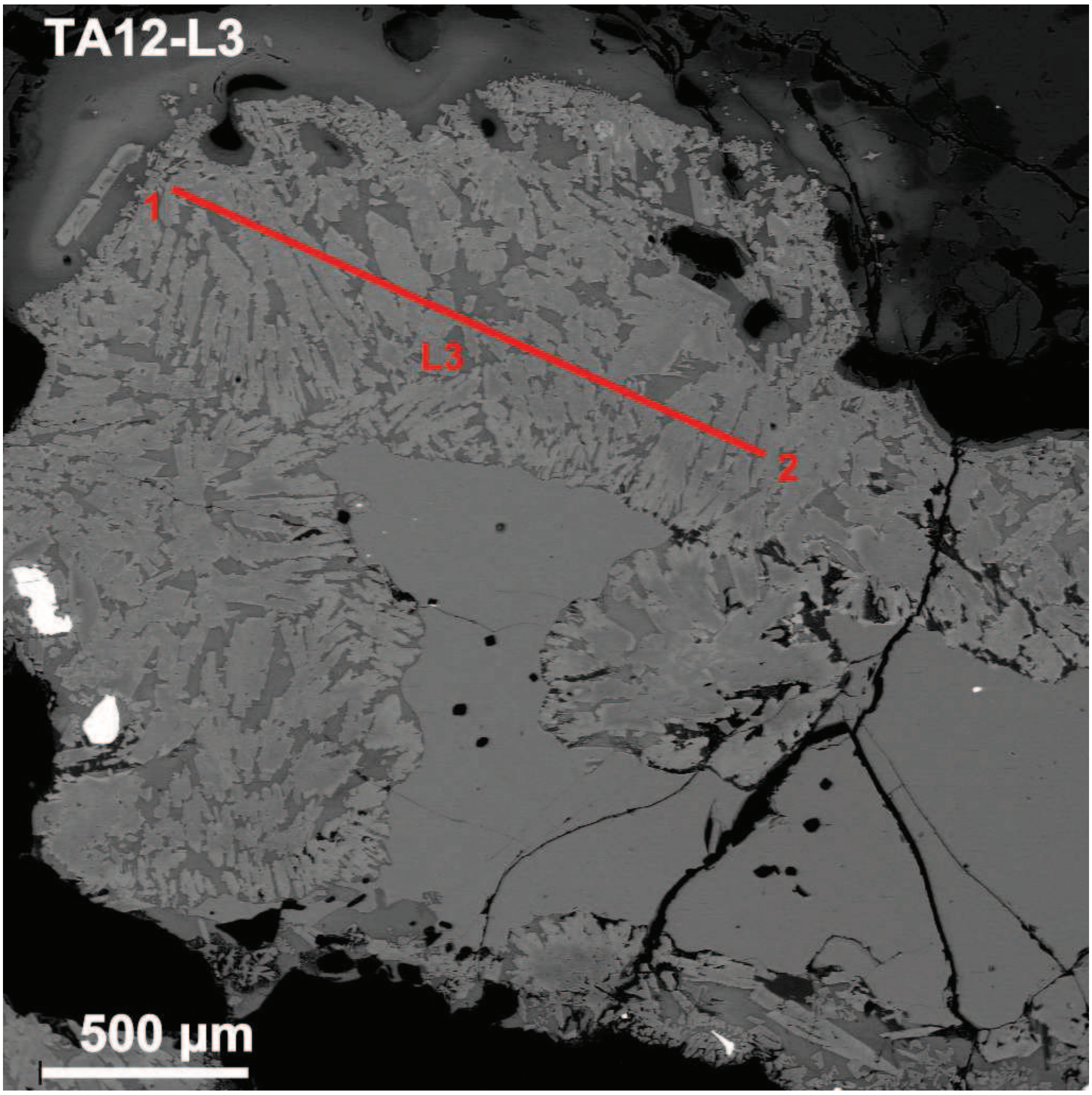

TA12-002
37-50
500 µm

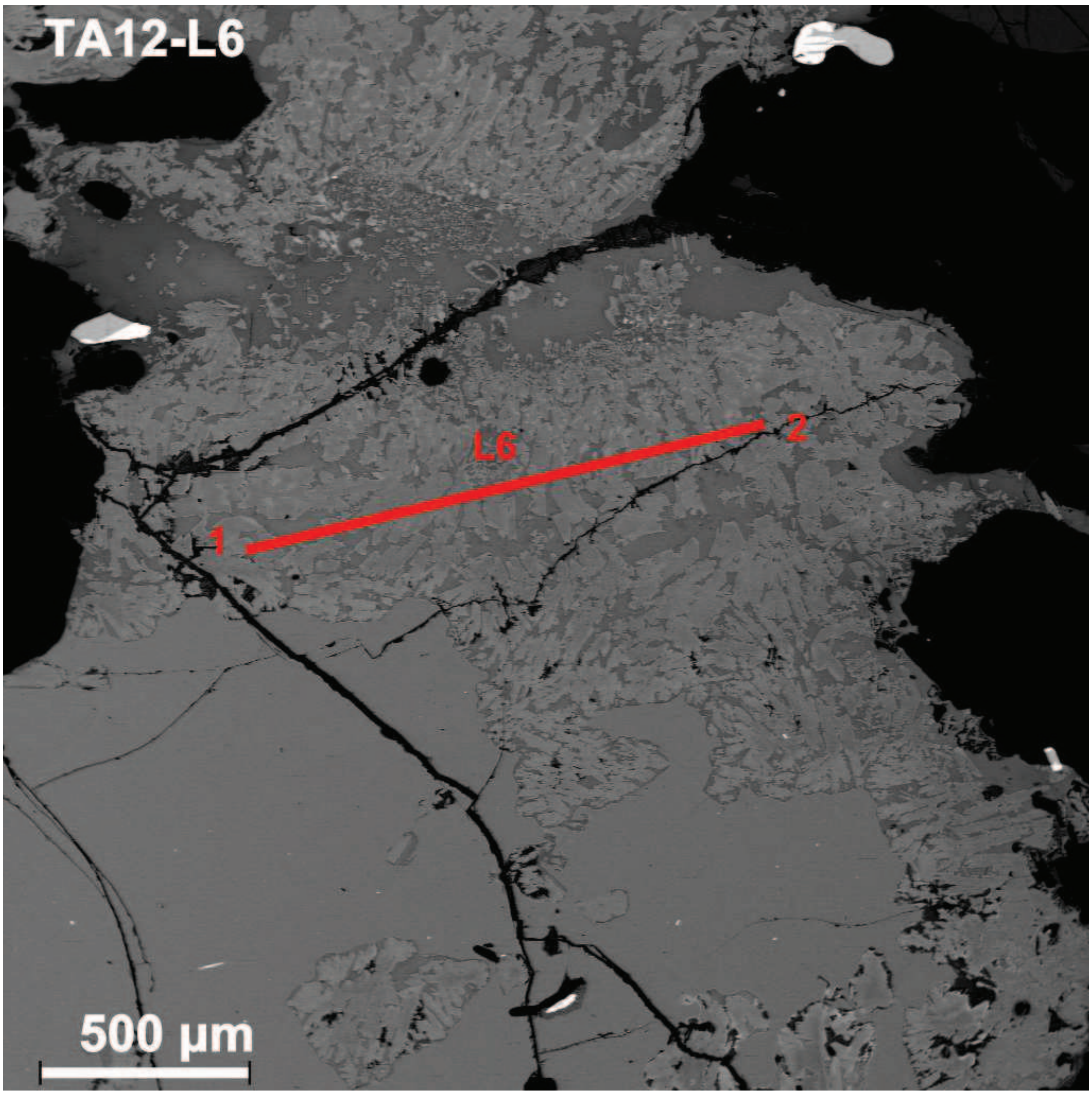


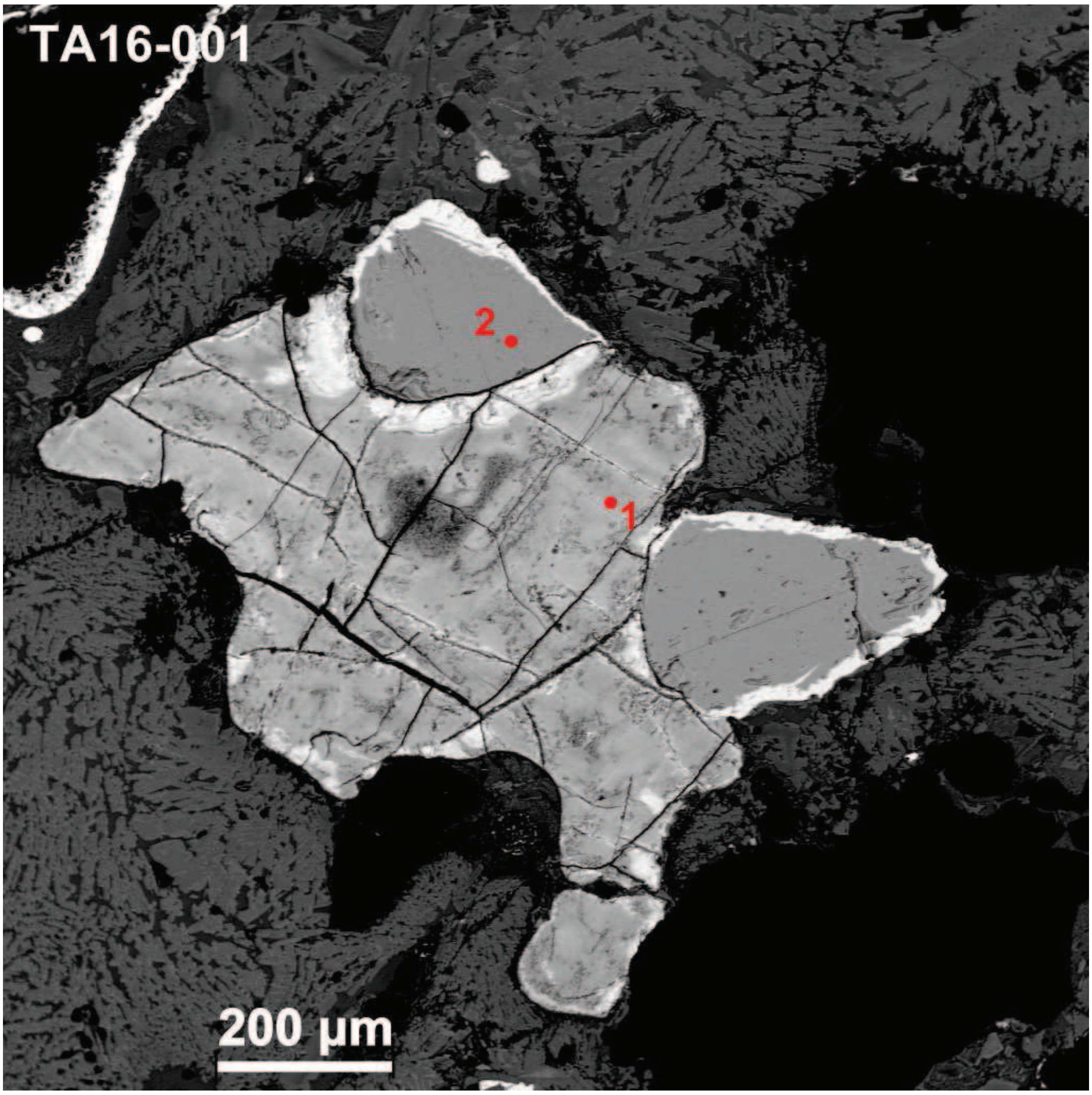
TA12-002
52
51
1
55
53
54
2
L4
1
56
L5
2
500 µm

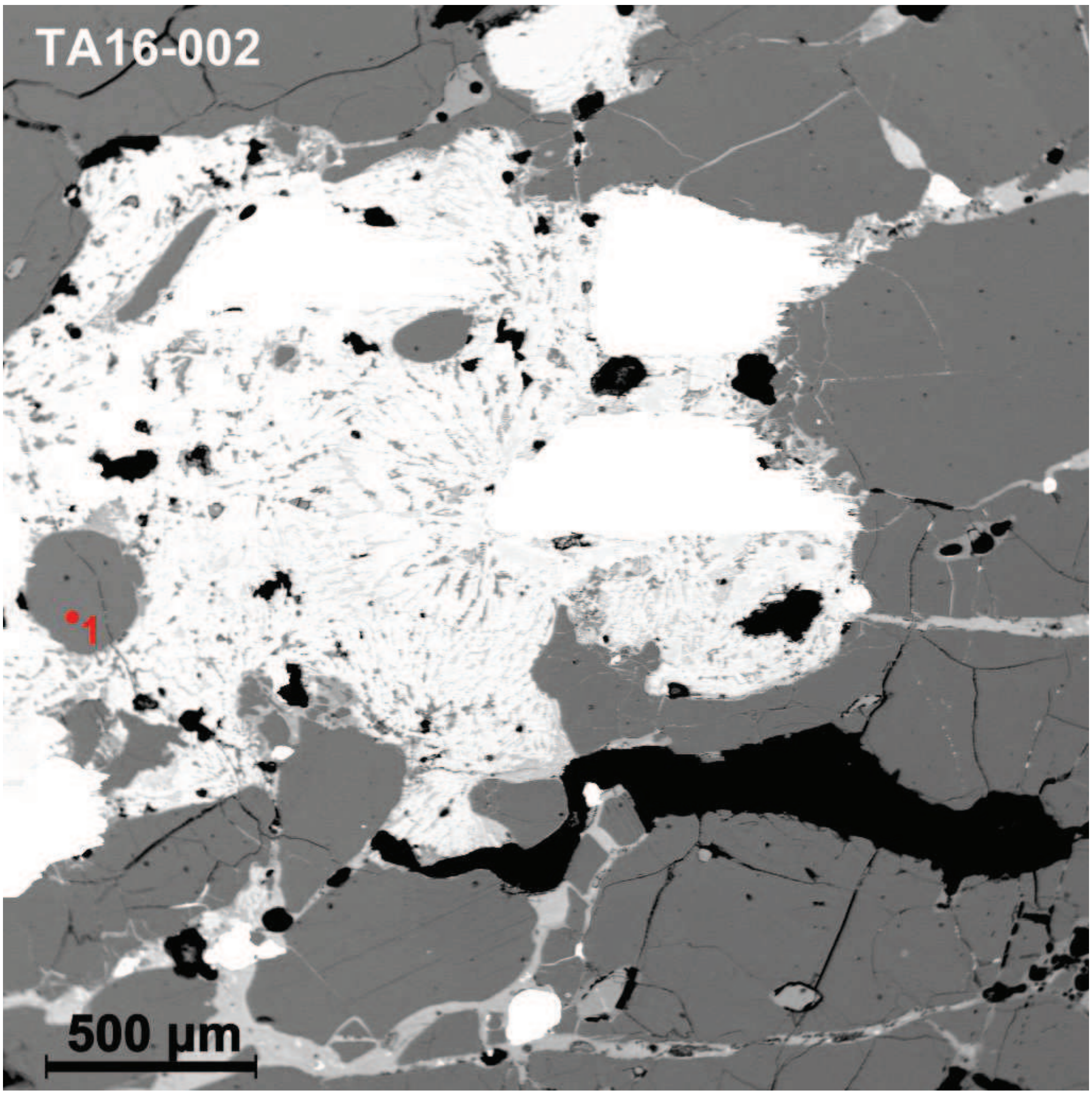


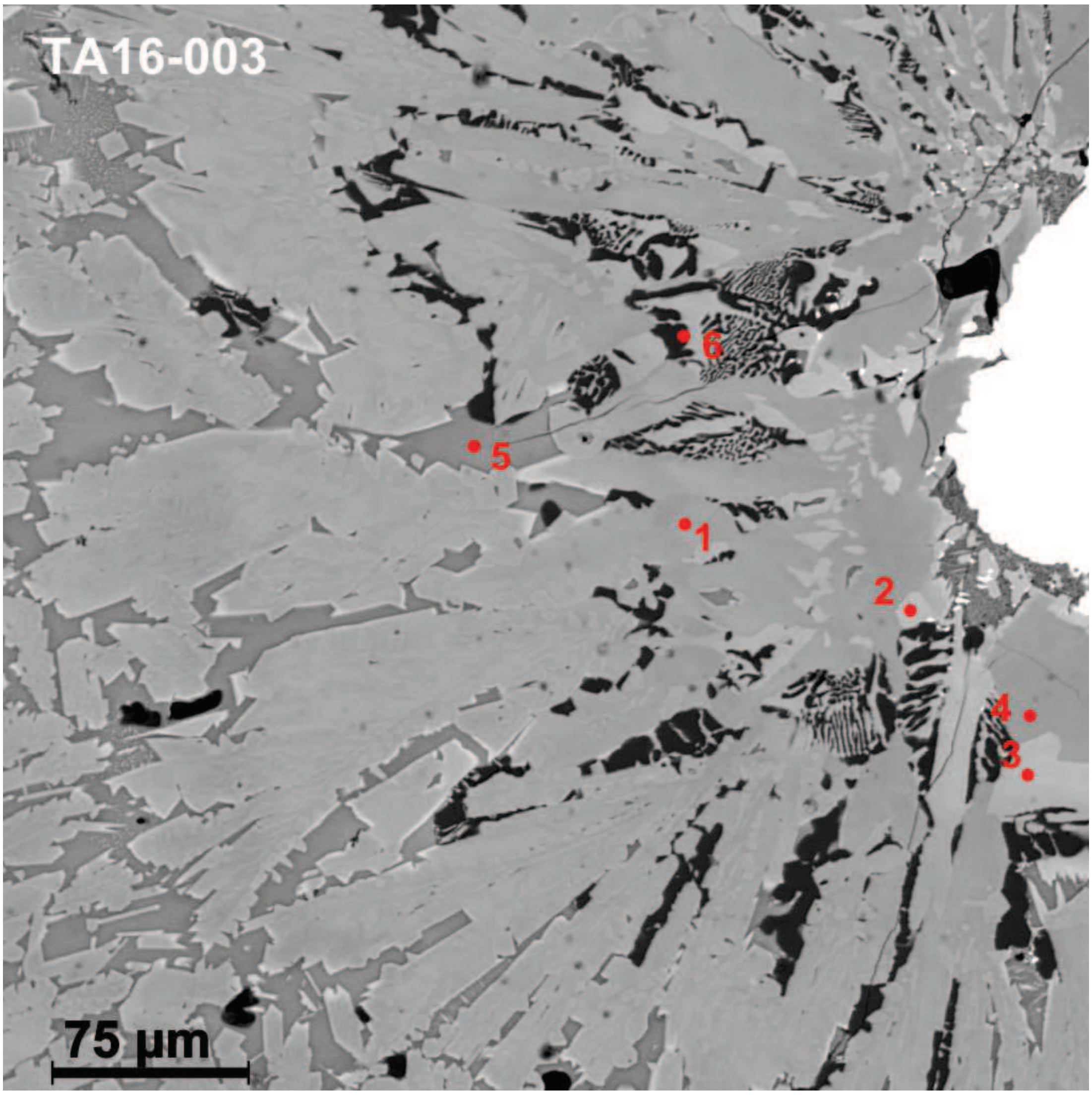
TA12-005
63
1
62
61
64
L2
2
57
58
59
60
500 µm

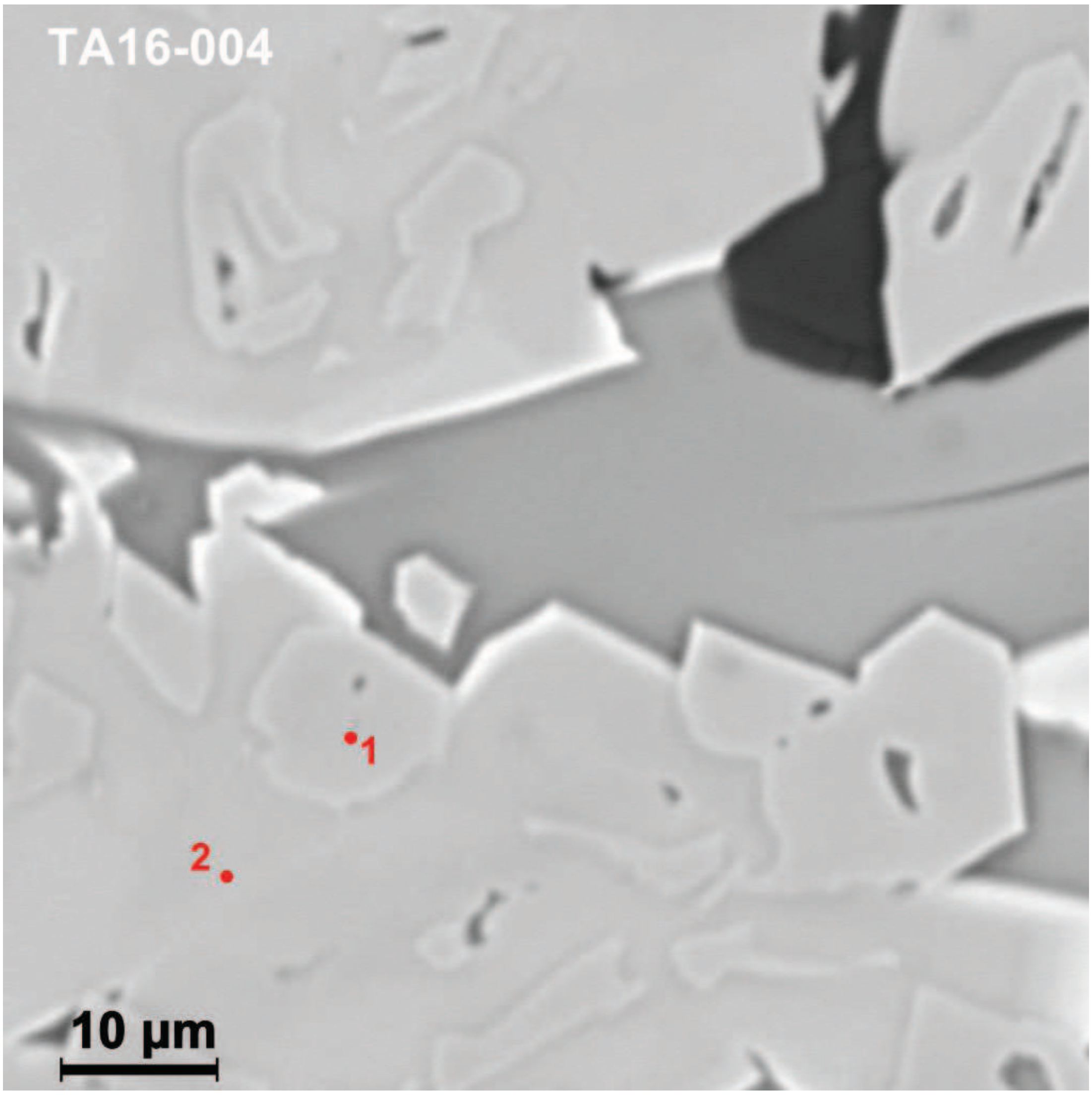

TA12-L3
1
L3
2
500 µm

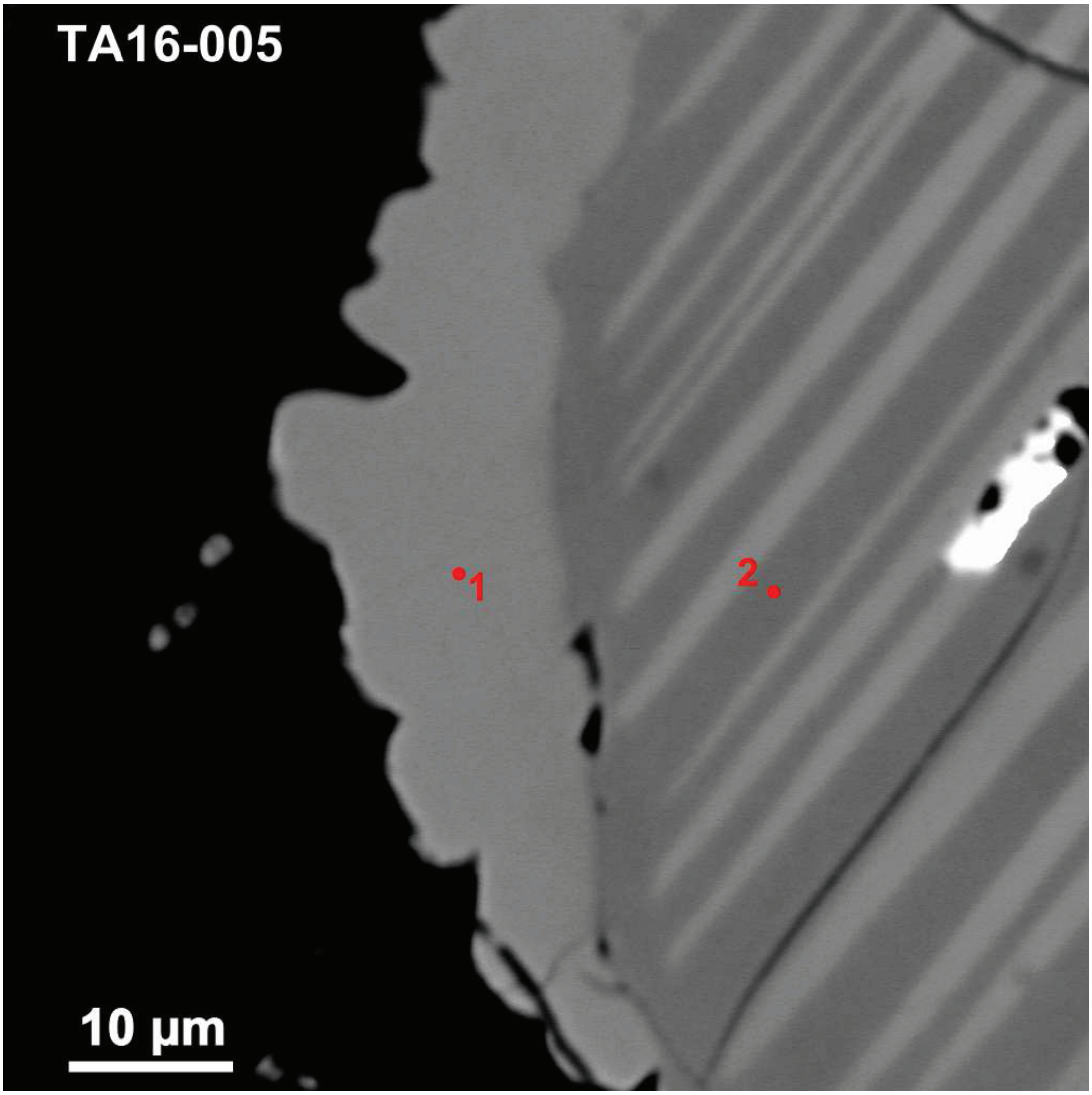

TA12-L6
L6
2
1
500 µm

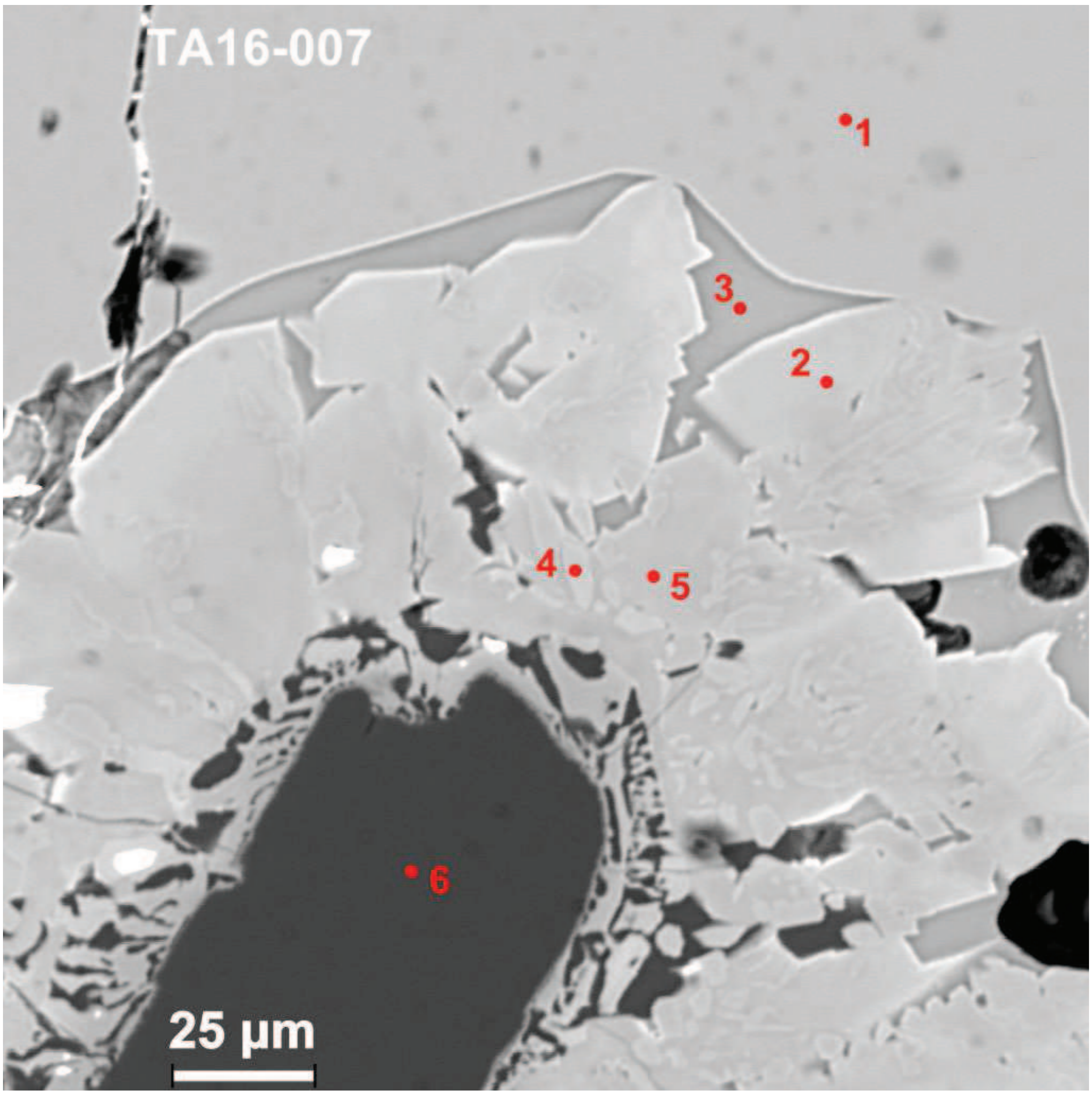

TA16-001
2
1
200 µm

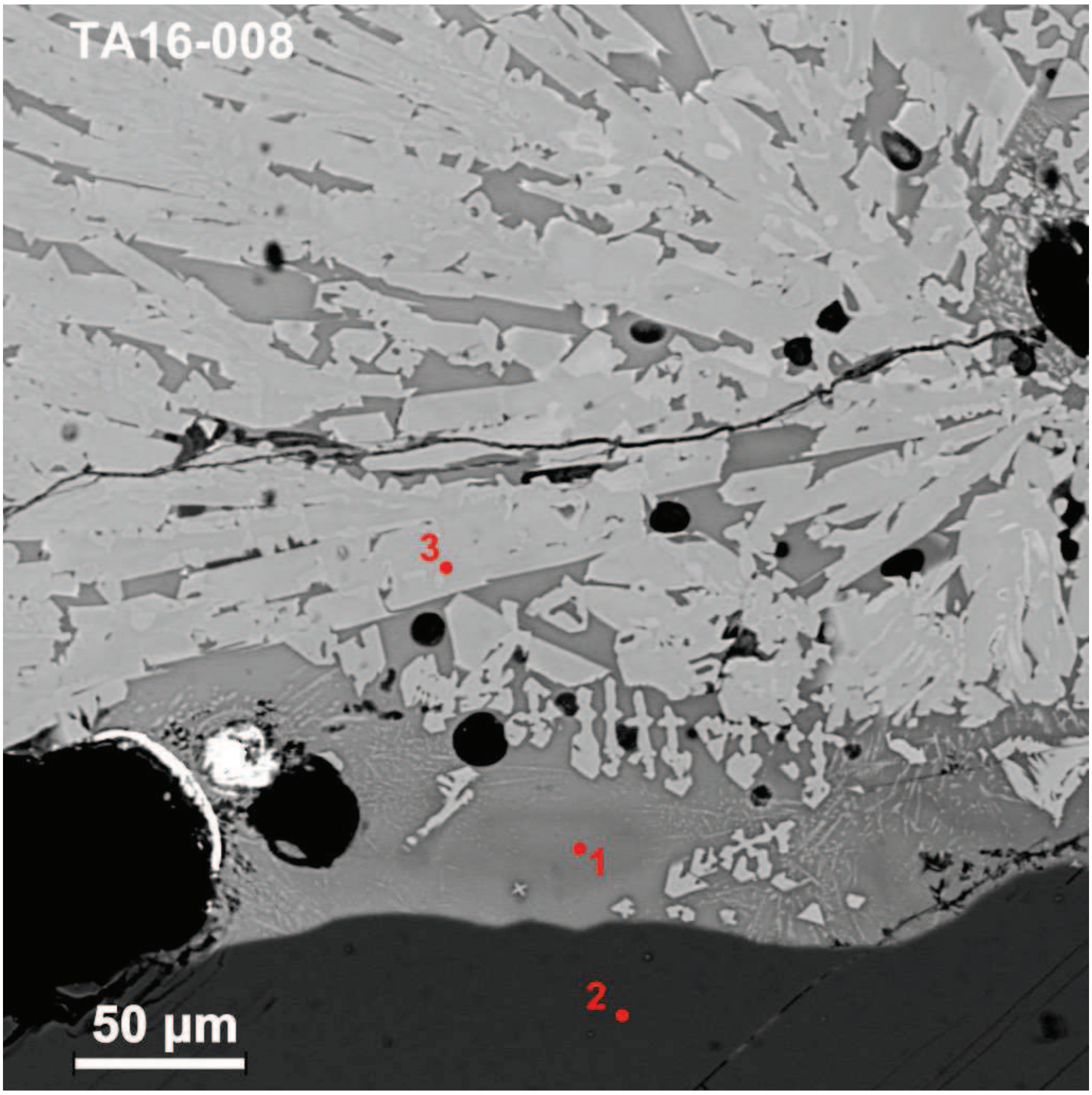

TA16-002
1
500 µm

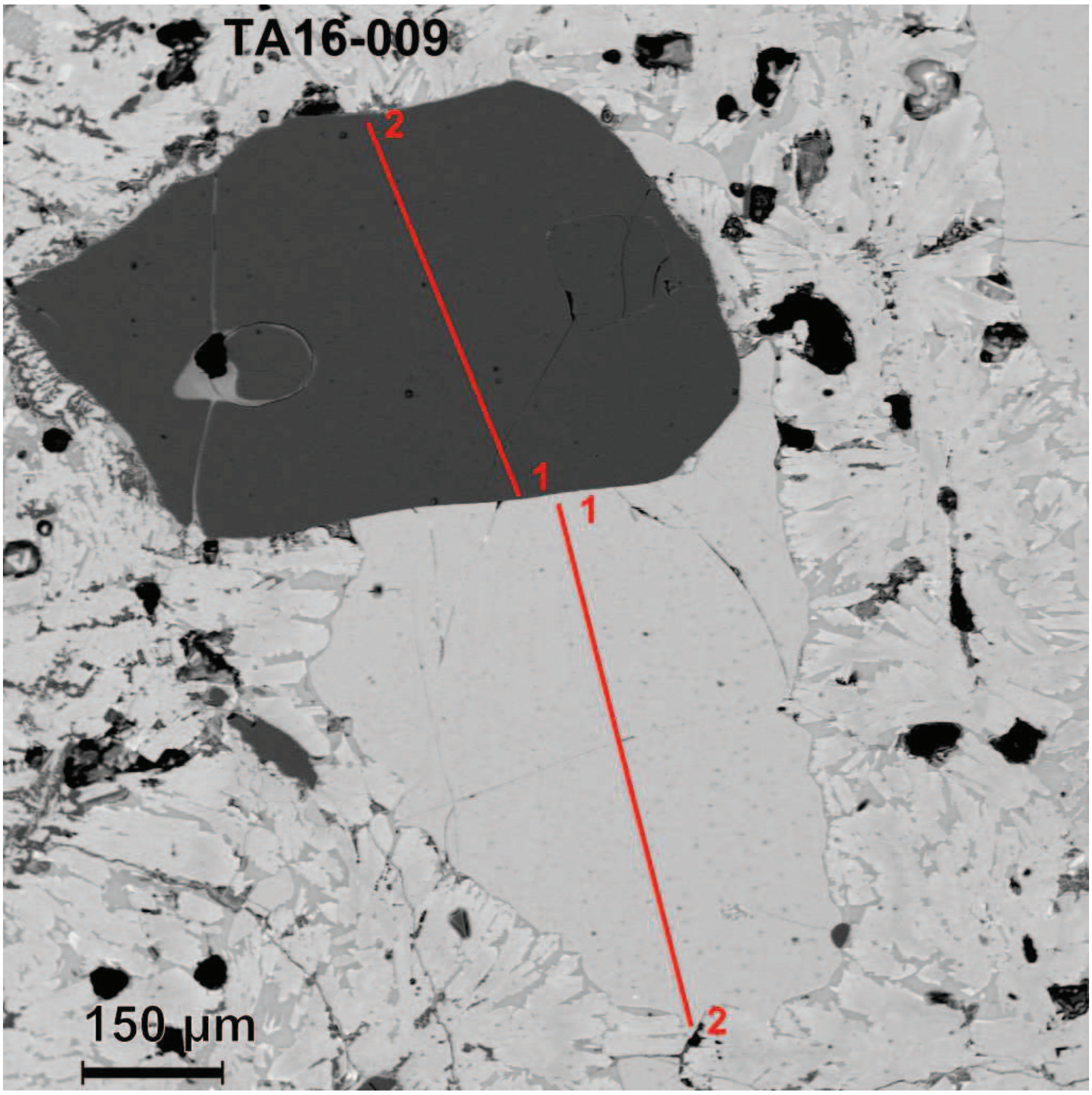

TA16-003
6
5
1
2
4
3
75 µm

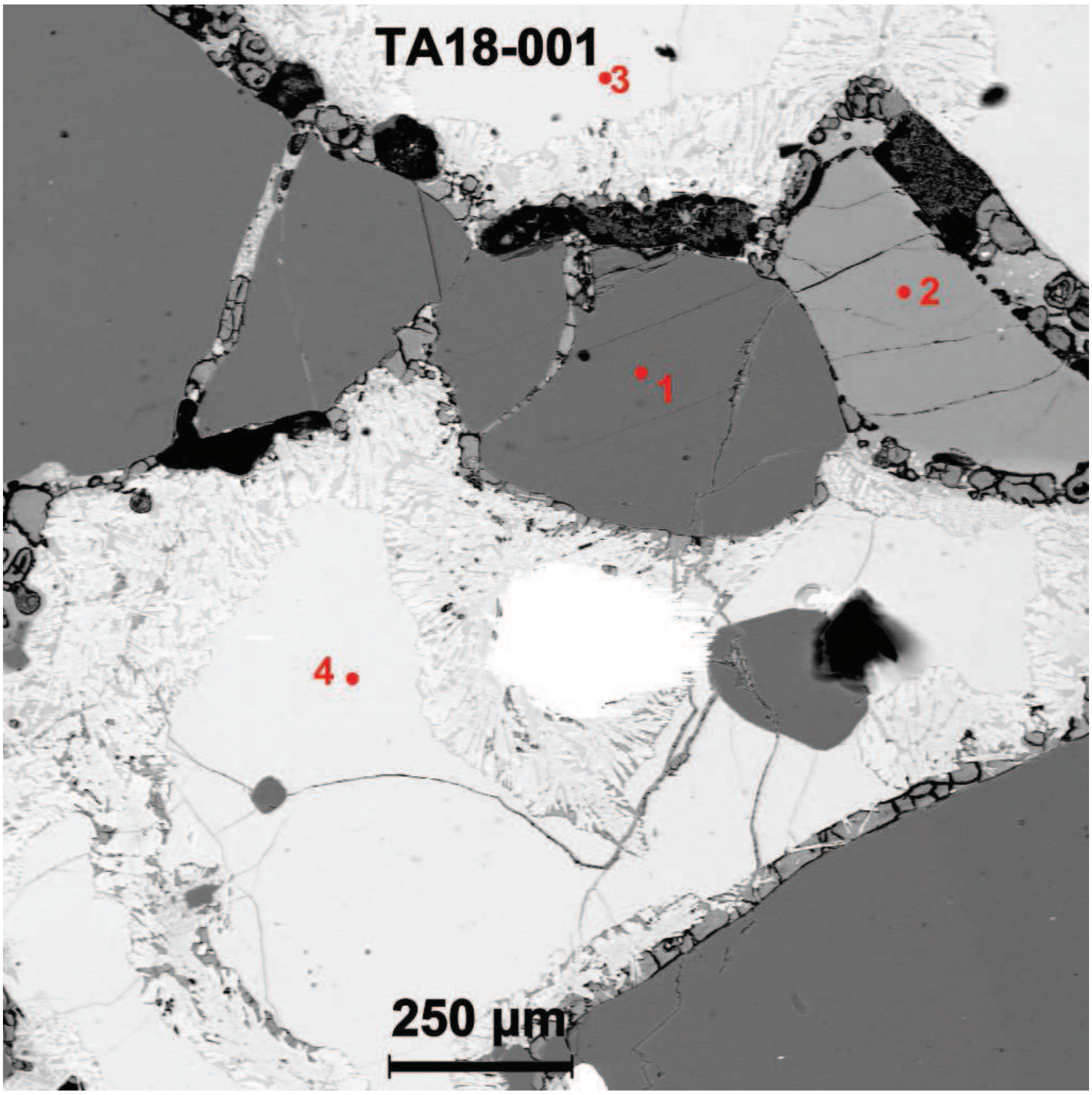

TA16-004
1
2
10 µm

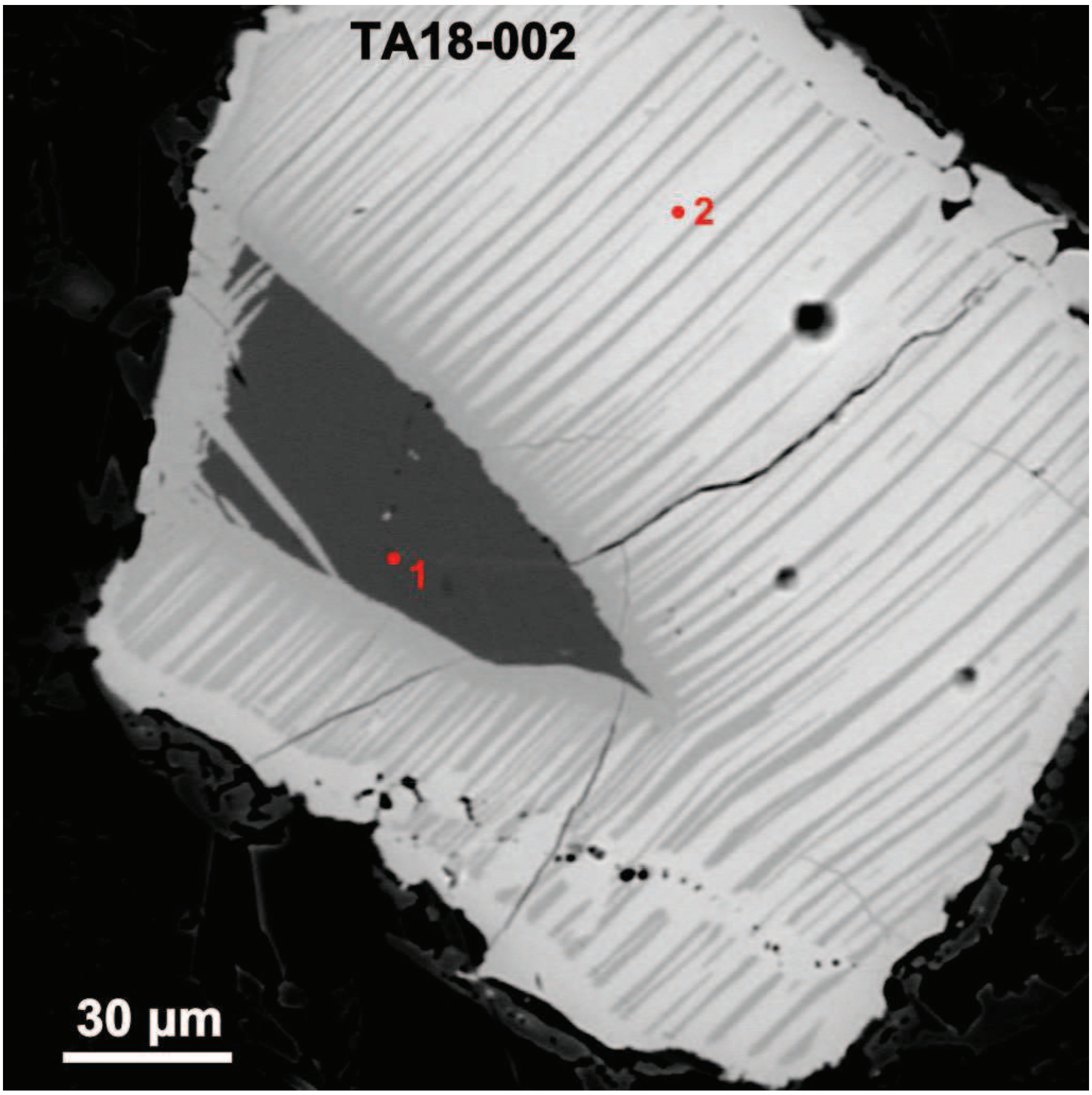

TA16-005
1
2
10 µm

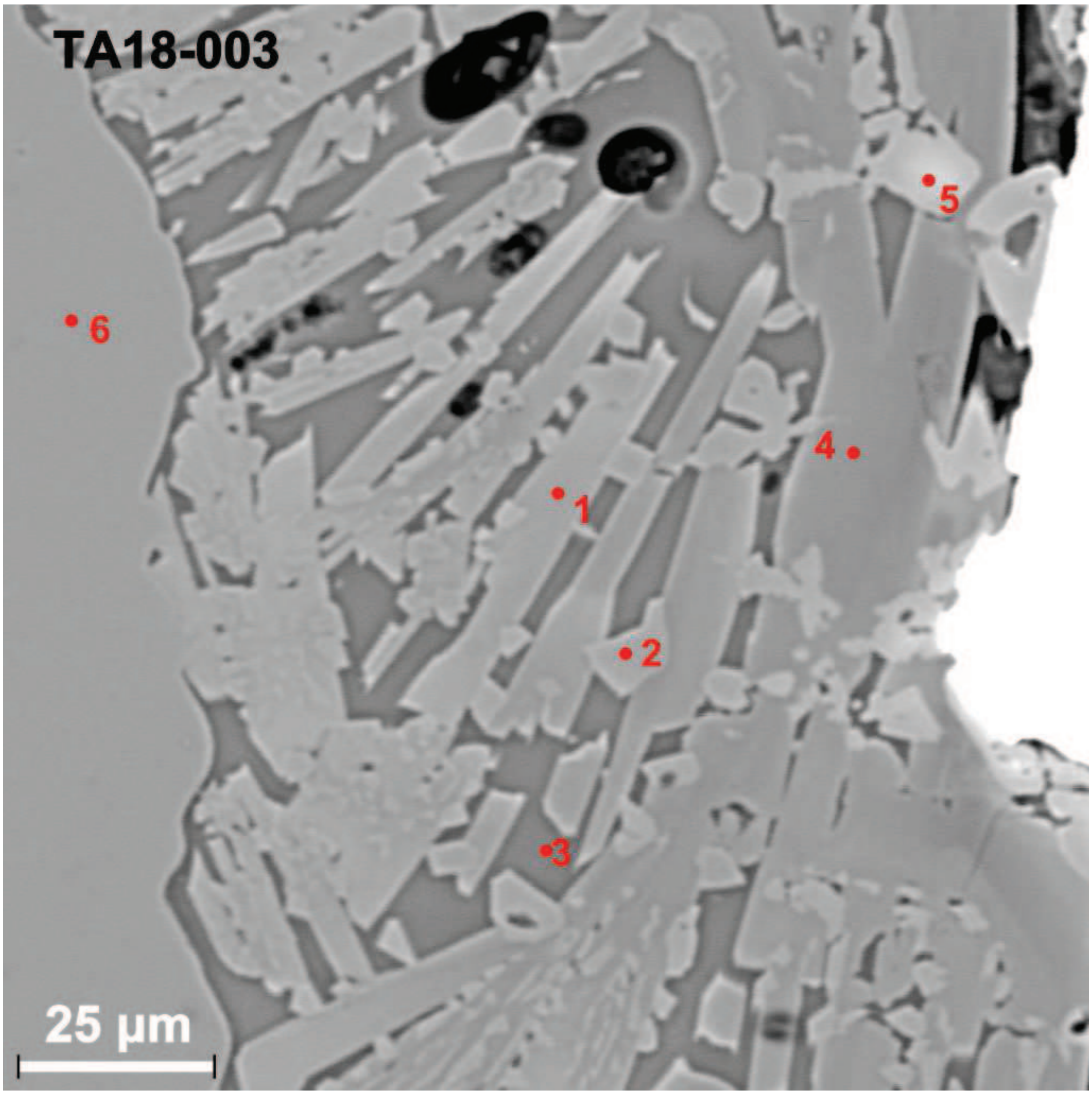

TA16-007
1
3
2
4
5
6
25 µm

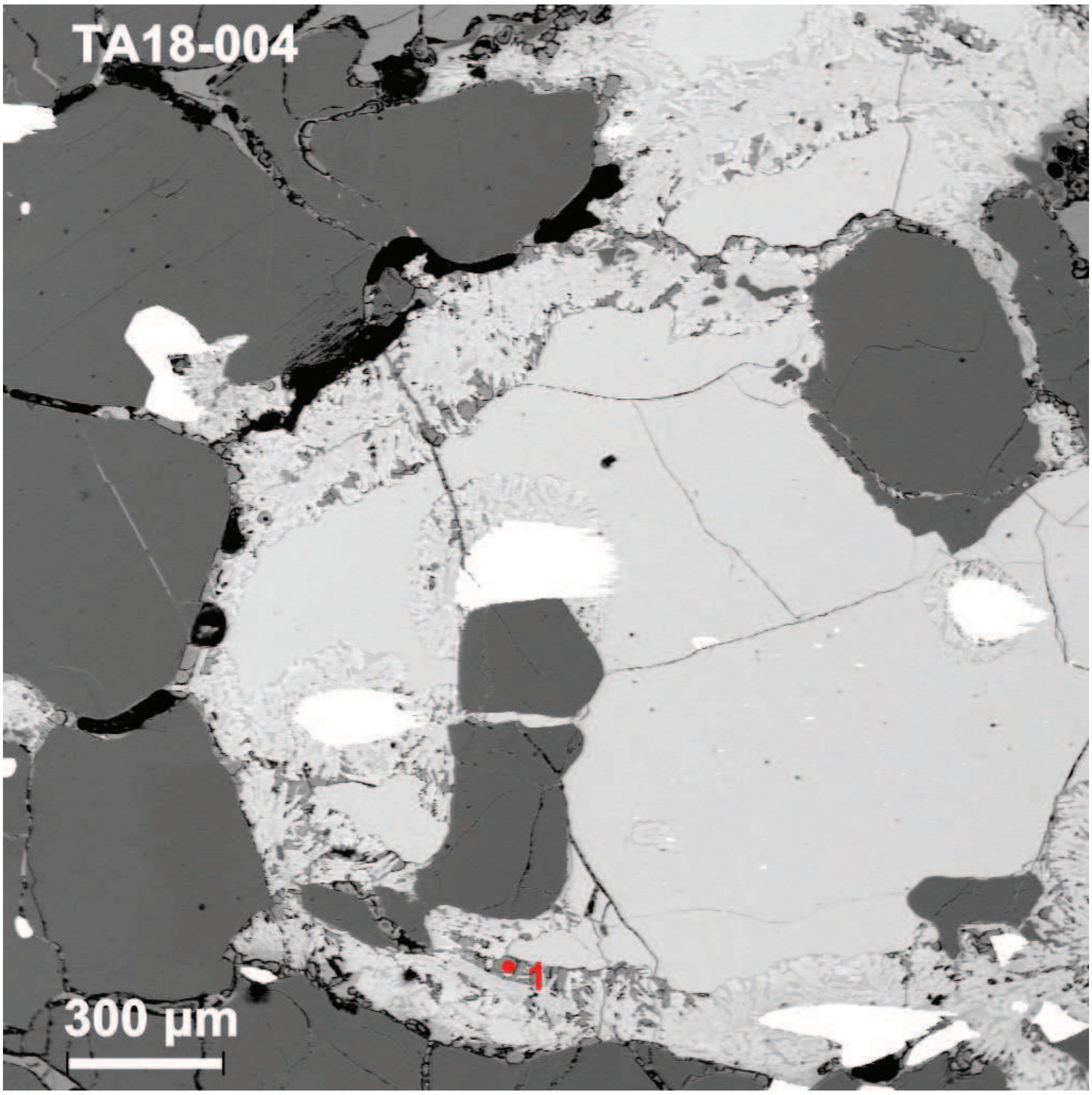

TA16-008
3
1
2
50 µm

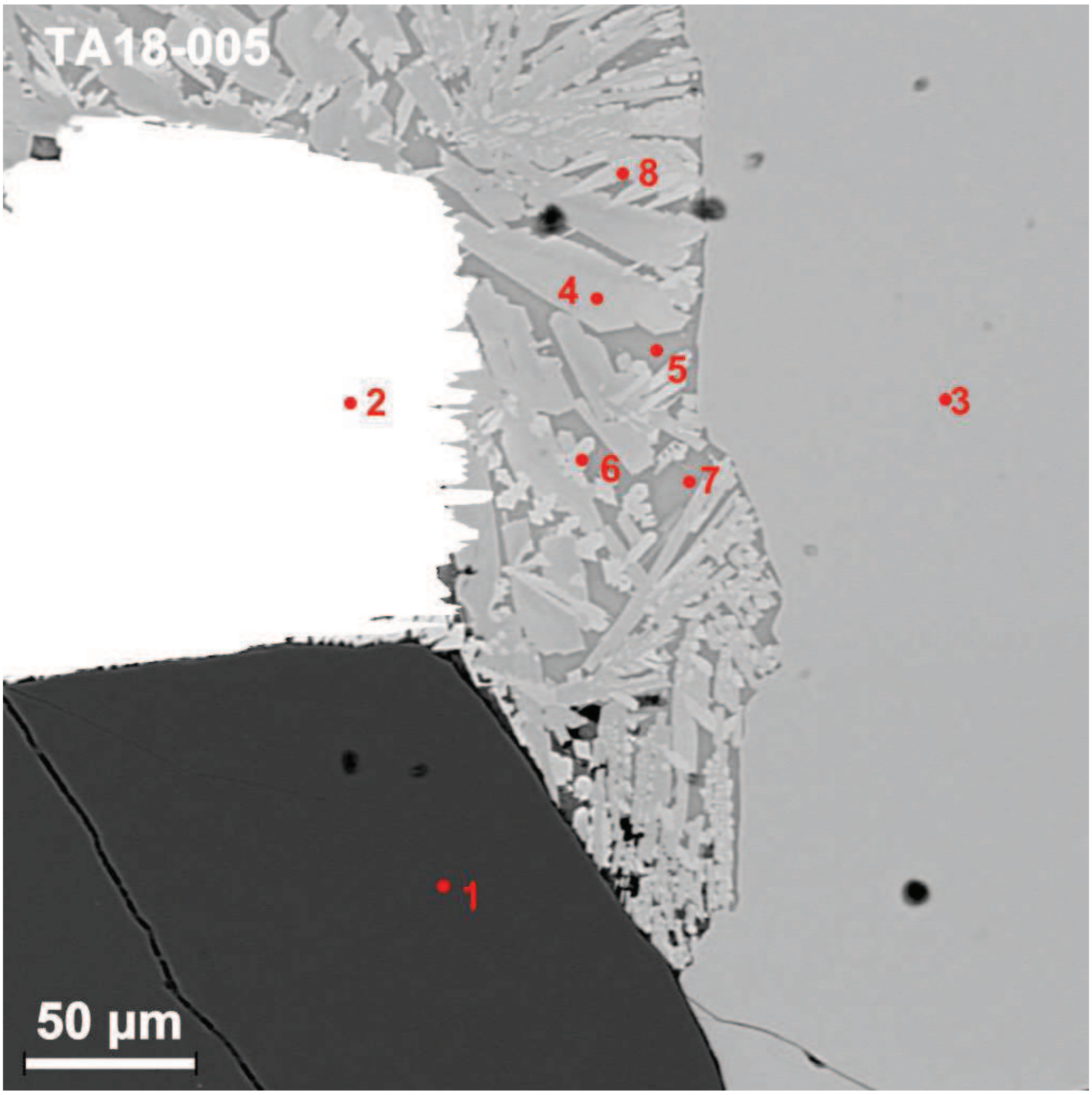

TA16-009
2
1
1
2
150 µm

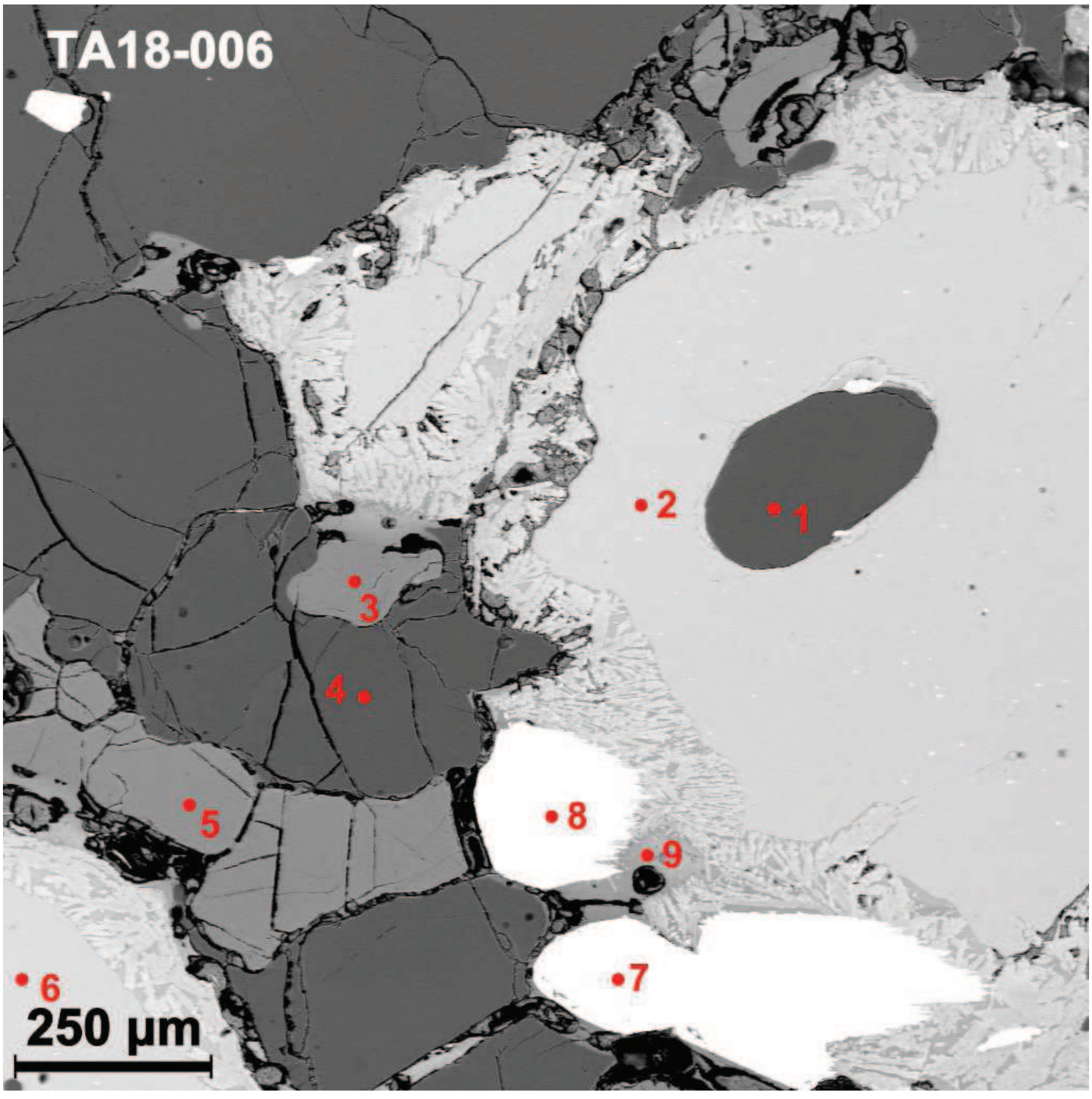

TA18-001
3
2
1
4
250 µm

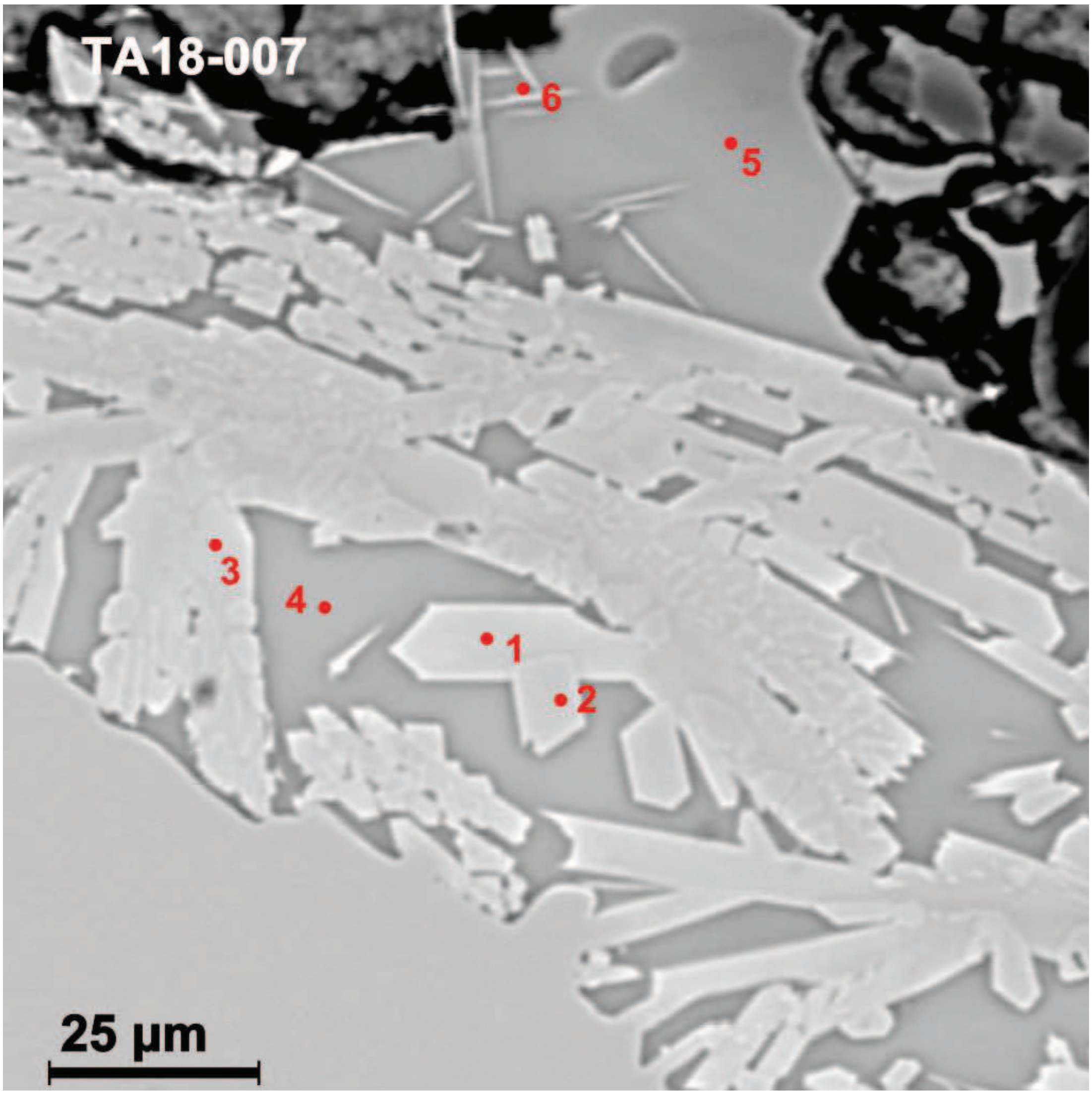

TA18-002
2
1
30 µm

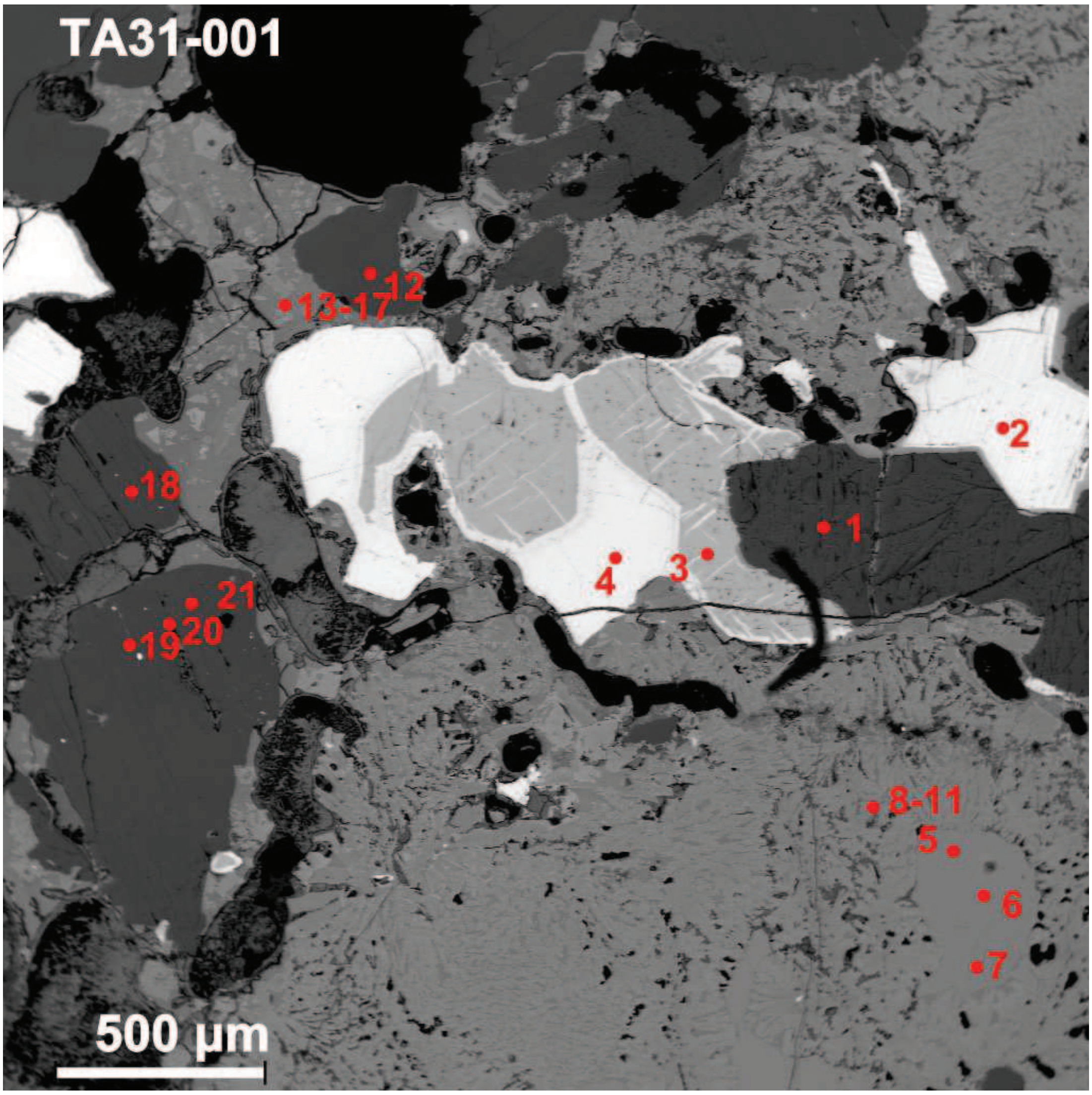

TA18-003
1
2
3
4
5
6
25 µm

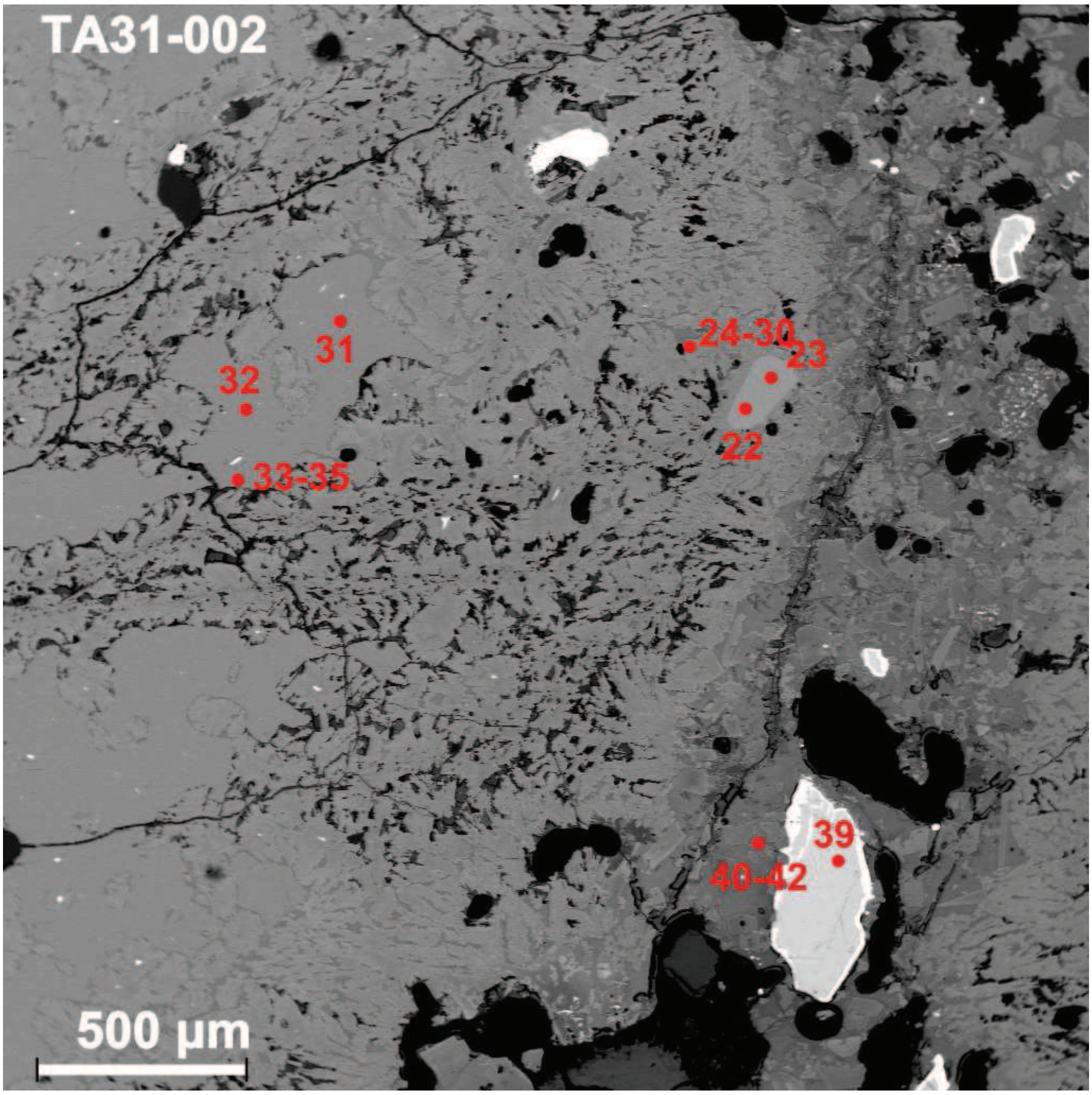

TA18-004
1
300 µm

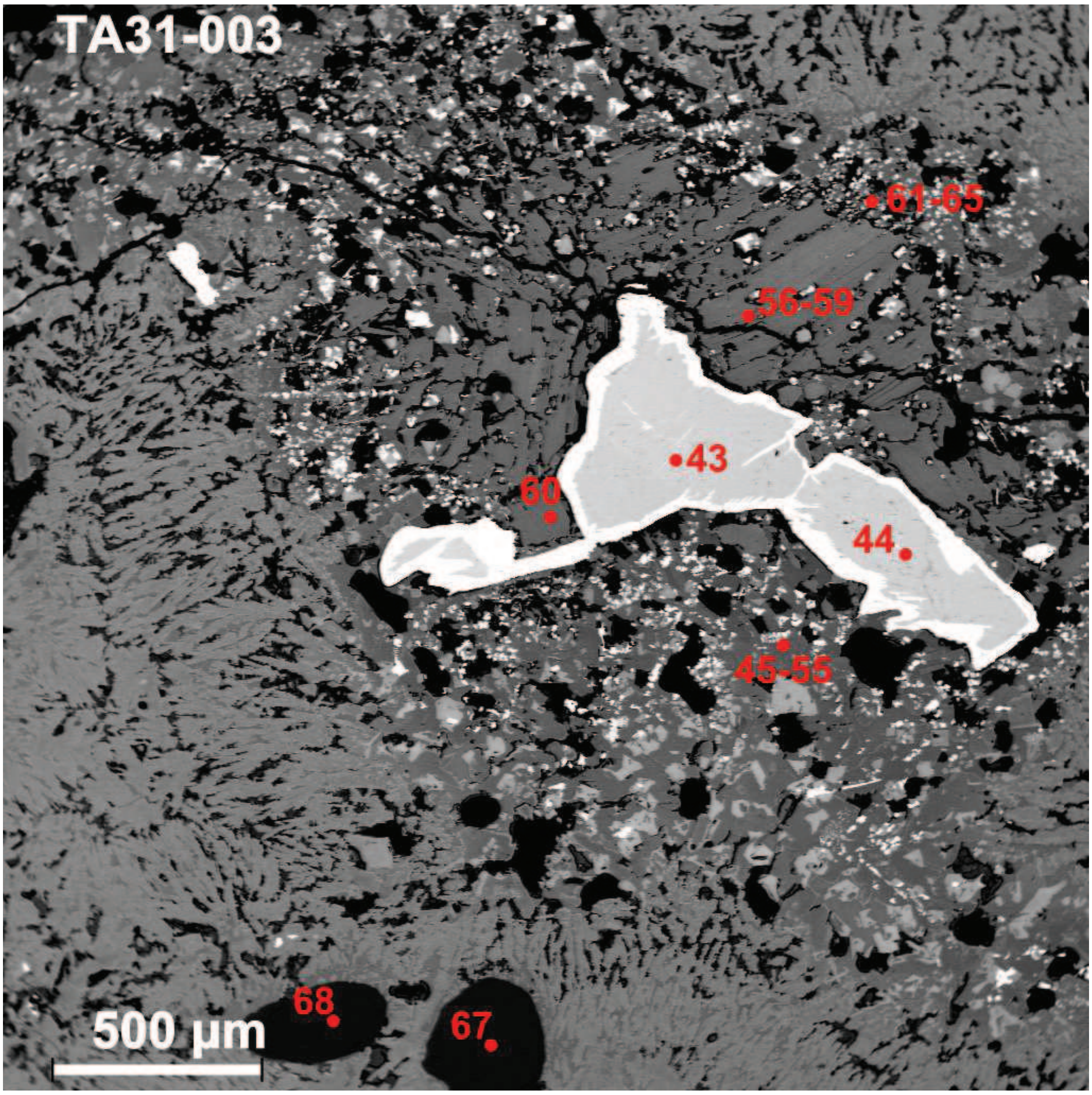

TA18-005
8
4
5
2
3
6
7
1
50 µm

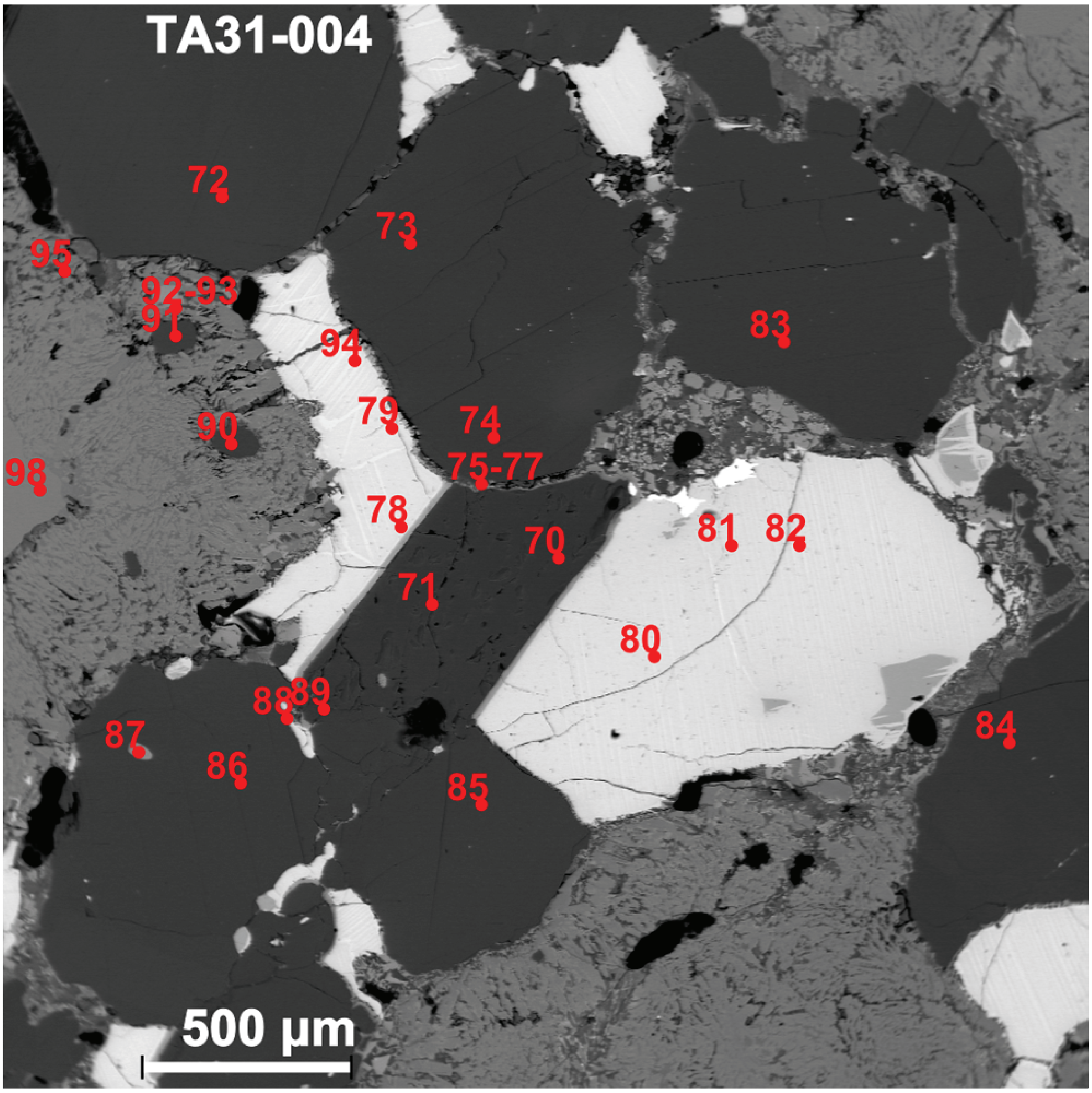

TA18-006
2
1
3
4
5
8
9
6
7
250 µm

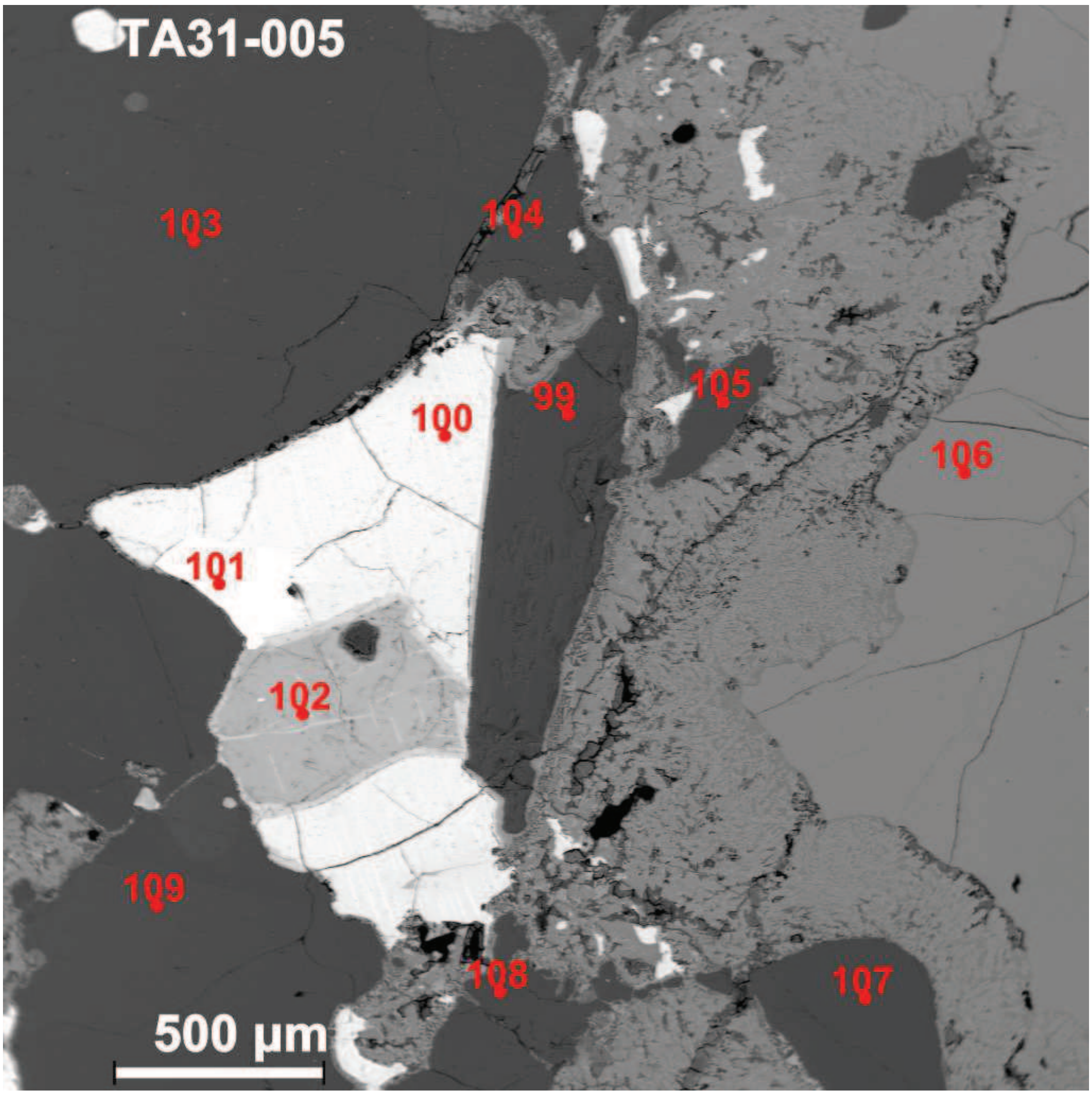

TA18-007
6
5
3
4
1
2
25 µm

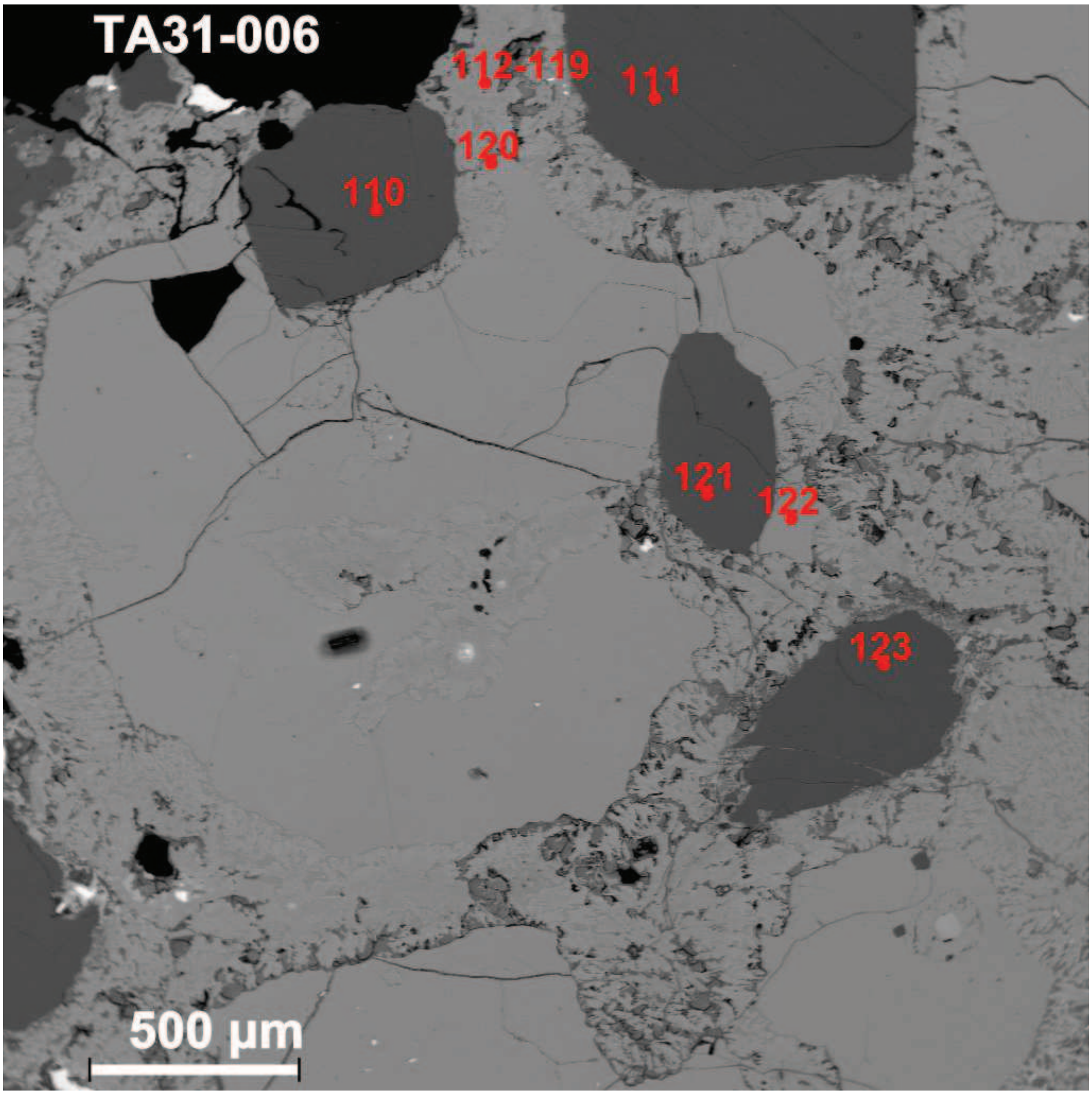

TA31-001
12
13-17
2
18
1
4
3
21
20
19
8-11
5
6
7
500 µm


TA31-002
31
32
24-30
23
22
33-35
39
40-42
500 µm


TA31-003
61-65
56-59
43
60
44
45-55
68
67
500 µm


TA31-004
72
73
95
92-93
91
94
83
90
79
74
98
75-77
78
81
82
70
71
80
88
89
84
87
86
85
500 µm


TA31-005
103
104
105
99
100
106
101
102
109
108
107
500 µm


TA31-006
112-119
111
120
110
121
122
123
500 µm

			SI-K	AL-K	FE-K	MN-K	MG-K	CA-K	K-K	NA-K	TI-K	CR-K	NI-K	ZN-K	CL-K	F-K	
Foto	Nr	Min	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	Compound_%	
BG2-001	1	gt	37.6209	20.7197	30.3947	1.46695	6.86945	1.8659	2.4838E-09	2.1138E-09	0.0336726	0.0171351	1.5116E-08	9.7142E-09	0.0140477	5.148E-09	99.0024554
BG2-001	2	gt	37.7415	20.5505	30.483	1.44888	6.81788	1.90205	2.4833E-09	2.1159E-09	0.0305534	0.0111925	0.0149172	0.0199152	0.00055677	5.1453E-09	99.0209451
BG2-002	1	sp	0.509271	57.2195	36.0343	0.69802	5.57651	2.4119E-09	2.4444E-09	0.00821189	0.0355286	0.0236708	1.4932E-08	0.0738269	0.011612	4.5321E-09	100.190451
BG2-002	2	opx	45.2091	7.41091	33.3185	1.93137	10.8635	0.382158	2.4854E-09	0.0389173	1.3266E-08	0.00112811	0.0290256	0.0414292	6.89E-09	0.0237237	99.2497619
BG2-002	3	opx	47.5733	2.80933	34.5751	1.93472	11.5918	0.309844	2.4831E-09	2.1879E-09	0.0127445	0.020237	1.5095E-08	0.0364197	0.00561308	0.187504	99.0566123
BG2-001	3	opx	50.6219	2.27743	25.8737	0.330502	19.6708	0.132437	2.5332E-09	0.00211064	0.0886425	0.00700406	1.5278E-08	0.142684	7.019E-09	5.2323E-09	99.1472102
BG2-001	4	plag	63.8136	24.9235	0.0700101	7.8448E-09	0.00308252	5.35497	1.75918	5.63541	0.0126577	1.8073E-08	0.00565762	1.0161E-08	0.00469625	0.148286	101.73105
BG2-004	1	bio	36.0622	14.4907	16.1954	7.5769E-09	13.1193	0.021929	9.07841	0.572972	5.41654	0.0140191	1.5222E-08	0.0719436	0.00835044	0.710598	95.7623622
BG2-004	2	?	31.374	33.9587	10.8051	7.6524E-09	5.73062	5.01316	2.34928	0.118507	2.00884	0.0204714	1.5352E-08	0.251769	0.029567	0.0961271	91.7561415
BG2-004	3	opx	50.6954	5.08136	14.6933	0.0537184	26.0502	0.626899	2.5816E-09	0.0223055	0.83846	0.0029412	1.547E-08	0.0340433	0.00579427	0.133595	98.2380167
BG2-004	4	TiMa	0.125672	11.2971	59.777	0.0768749	5.91738	0.0661911	2.2699E-09	0.00376794	18.373	0.0348181	0.080727	0.463857	0.00759812	4.5714E-09	96.2239862
BG2-004	5	opx	49.7531	6.22367	14.7898	0.0256776	26.3383	0.608056	2.5798E-09	0.0289355	1.02237	1.697E-08	1.5467E-08	9.9957E-09	7.1348E-09	0.0838982	98.8738074
BG2-004	6	chl?	55.6101	18.3734	3.91574	0.0100243	1.20019	6.56916	1.82719	0.103892	1.84538	0.00283052	0.0281498	1.0079E-08	0.00346602	0.153465	89.6429877
BG2-003	1	qtz	98.3931	0.0166839	0.0305531	7.9123E-09	0.00180483	0.00698214	0.00745238	0.0309922	1.4691E-08	1.8202E-08	1.5823E-08	1.0274E-08	0.0127076	6.8906E-09	98.5002762
BG2-005	1	gt	37.6708	21.0734	29.2484	1.50402	7.52702	1.87984	2.4884E-09	0.0249993	0.0410106	1.5891E-08	0.00781917	0.043212	0.00502039	5.1862E-09	99.0255415
BG2-006	1	opx	43.9171	10.7853	27.8599	1.55265	13.6606	0.354892	2.5081E-09	0.0258722	0.0494999	1.5942E-08	0.0386448	0.0150175	0.00849874	0.0972872	98.3652624
BG2-006	2	?	51.0232	19.9015	1.25329	0.0769275	0.125177	7.85197	2.62543	0.169281	1.4633E-08	0.0109133	1.5592E-08	1.0108E-08	0.0133348	0.105135	83.1561586
BG2-006	3	opx	44.6464	10.3677	31.0161	1.79725	11.4291	0.350016	2.496E-09	0.00964672	0.0337122	1.5769E-08	1.5141E-08	0.0116359	0.00789795	5.1268E-09	99.6694588
BG2-007	1	gt	37.9892	21.0938	29.1879	1.52282	7.49683	1.98089	2.4888E-09	0.0212779	0.0267658	0.0149294	1.5139E-08	0.0199483	6.8955E-09	0.0498914	99.4042528
BG2-008	1	opx	43.6852	11.0845	28.7713	1.61199	12.9817	0.336175	2.504E-09	0.0167092	0.0204131	0.00527479	1.5175E-08	0.0349991	0.00905349	0.0263987	98.5837134
BG2-008	2	sp	0.107171	57.469	33.739	0.768999	7.11236	2.4205E-09	2.4524E-09	0.00529456	0.0369668	0.0220879	1.4962E-08	0.0871619	0.00887158	4.59E-09	99.3569128
BG2-008	3	opx	43.7531	9.1575	32.3441	1.7975	10.9803	0.399327	2.4876E-09	2.1519E-09	0.0208377	1.5662E-08	0.00078068	0.0563912	0.00618793	5.065E-09	98.5160245
BG2-007	2	?	62.9422	12.752	3.44424	0.0645868	0.153135	4.98945	3.19615	0.420357	0.0582808	1.7873E-08	0.037892	1.0114E-08	0.0163265	0.238129	88.3127471
BG4-001	1	corund	0.00996136	98.3314	0.950007	7.7541E-09	0.00130674	2.5959E-09	2.6189E-09	1.4687E-09	0.00831747	0.0973218	1.5533E-08	0.00513652	7.2228E-09	5.9614E-09	99.4034509
BG4-001	2	opx	43.8719	12.1143	27.8416	0.609323	13.6022	0.390608	2.5134E-09	0.00298144	0.0298851	1.5971E-08	0.00628703	9.7852E-09	6.9649E-09	5.1458E-09	98.4690846
BG4-001	3	plag	52.8869	29.5353	0.0788214	7.8347E-09	0.0004882	12.0501	0.249064	4.27778	0.0322841	0.00182615	0.015316	0.0120313	7.1387E-09	6.8365E-09	99.1399112
BG4-001	4	opx	44.6537	10.5862	22.926	0.390184	17.1063	0.993342	2.5301E-09	0.0172263	0.803564	0.0248647	0.0404478	0.0604893	7.0061E-09	0.0351236	97.6374417
BG4-002	1	gt	38.6543	21.5217	26.0708	0.481688	9.71462	2.47443	2.5048E-09	0.025101	0.0324917	0.0165586	0.0165772	0.0417725	6.9393E-09	0.108614	99.158653
BG4-003	1	opx	43.081	12.7164	28.7355	0.584937	12.9294	0.371199	2.5084E-09	2.0683E-09	0.0676729	1.5908E-08	0.0165636	0.00834377	6.9515E-09	5.1077E-09	98.5110163
BG4-003	2	opx	43.6517	12.2577	26.8345	0.59647	14.4008	0.577482	2.5163E-09	0.00540084	0.0672236	0.0134351	0.0134335	0.0685788	0.0011282	0.0143322	98.5021842
BG4-003	3	sp (zn)	6.9792E-09	53.9014	27.3684	7.2411E-09	7.86618	2.4172E-09	2.4505E-09	2.1696E-09	0.0936208	0.696911	0.696902	7.39202	0.00778336	0.12897	98.1521872
BG4-003	4	opx	44.6477	10.2384	26.8481	0.581391	15.0964	0.831974	2.516E-09	0.0209845	0.0375936	0.00881258	1.5226E-08	0.0853169	0.00112813	0.0308985	98.4286992
BG4-003	5	sp (zn)	6.9923E-09	54.791	27.2601	0.00943195	7.98577	2.4208E-09	2.4539E-09	2.1571E-09	0.0600095	0.341305	0.677021	7.2923	6.8038E-09	4.5158E-09	98.4169375
BG4-003	6	opx	48.2495	5.92484	29.315	0.661462	15.2061	0.282671	2.5132E-09	0.0243867	0.0319046	0.00299092	1.5211E-08	9.7829E-09	0.0079446	5.1379E-09	99.7067999
BG4-002	2	plag	53.5453	28.544	0.104097	7.8349E-09	0.0116327	10.8793	0.301916	4.95194	0.00136214	0.00208686	1.5604E-08	1.0126E-08	0.00639048	6.7955E-09	98.3480252
BG4-004	1	corund	0.0003487	98.4953	0.92625	7.7539E-09	0.00427758	0.00880146	2.6189E-09	0.0144036	0.0188227	0.052387	1.553E-08	0.0479397	7.2231E-09	5.959E-09	99.5685308
BG4-004	2	TiMa	5.9655E-09	3.10612	60.5383	0.297628	3.43094	2.183E-09	2.2318E-09	2.6882E-09	34.7667	0.123697	0.109832	0.206539	0.00497332	5.3413E-09	102.584729
BG4-004	3	corund	0.0137381	98.6428	1.27783	7.7502E-09	5.7345E-09	0.0186849	2.6174E-09	0.0129054	0.0350594	0.0425715	1.5526E-08	0.0290944	7.2189E-09	5.9468E-09	100.072684
BG4-004	4	sp (zn)	6.9805E-09	53.3121	27.2954	0.0351948	7.71331	2.4161E-09	2.4496E-09	2.1758E-09	0.0455516	0.573815	0.752778	7.46862	6.7925E-09	0.0324038	97.2291732
BG4-005	1	gt	38.4977	21.3902	26.0782	0.543545	9.85091	2.43717	2.5045E-09	0.0244554	0.00877641	0.0319246	1.5208E-08	9.7857E-09	6.9386E-09	5.2673E-09	98.8628814
BG4-005	2	TiMa	5.8257E-09	0.736542	46.9425	0.155855	2.35369	2.1581E-09	2.2126E-09	0.00154111	46.236	0.0773059	0.0163553	0.0342838	0.00147841	0.0217269	96.5772784
BG4-005	3	TiMa	0.0770574	5.10146	63.2576	0.204131	2.45222	2.1953E-09	2.2416E-09	2.743E-09	24.7429	0.147937	0.0852481	0.176725	0.00449917	0.0267367	96.2765144
BG4-006	1	opx/gt	39.1396	20.127	26.4751	0.630685	9.94514	2.2534	2.5038E-09	0.00013381	0.0311715	0.00860597	1.5202E-08	9.781E-09	0.00056128	5.2542E-09	98.6113976
BG4-006	2	opx	45.6635	9.27159	26.3191	0.616458	15.8913	0.632109	2.5197E-09	0.0212689	0.336726	1.6111E-08	0.0142373	0.0385107	0.00169446	5.2336E-09	98.8064944

BG4-006	3	plag	48.4139	31.3632	1.44502	0.0768132	0.137989	15.5668	0.0393382	1.5848	0.0233239	1.7985E-08	1.5555E-08	1.0077E-08	7.0601E-09	6.9077E-09	98.6511844
BG4-007	1	TiMa	0.0102433	2.67862	41.9201	0.576452	4.07853	2.1633E-09	2.2187E-09	2.5451E-09	47.6891	0.0249777	0.019421	9.2087E-09	0.00494085	6.5099E-09	97.0023849
BG4-007	2	sp	0.097769	51.9618	34.4354	0.241501	8.83363	2.4062E-09	2.4395E-09	0.0211842	1.64926	0.0737283	0.0473864	0.172311	0.0165617	4.5711E-09	97.5505316
BG4-007	3	opx	45.5939	9.04968	24.6437	0.534768	17.038	1.11069	2.523E-09	0.0380625	0.788609	0.00399076	1.5266E-08	9.8293E-09	0.00967626	5.3285E-09	98.8110766
BG4-007	4	sp	0.108274	54.954	32.4149	0.280243	9.20093	2.4222E-09	2.4539E-09	0.0202038	0.780301	0.0753519	1.4974E-08	0.121861	0.00832274	4.6107E-09	97.9643875
BG4-007	5	olivine	34.0881	0.110456	38.7396	0.642301	24.3943	0.133813	2.455E-09	0.0180033	0.0419121	1.5156E-08	0.0304671	0.0461663	0.0105723	4.5579E-09	98.2556911
BG4-007	6	plag	50.7926	29.4334	1.07668	0.0344817	0.106342	12.8852	0.520309	3.40642	0.135728	1.8001E-08	1.5572E-08	1.0094E-08	0.00114904	6.8372E-09	98.3923098
BG4-007	7	sp	0.0955157	52.7034	34.3872	0.236412	8.8451	0.0057908	2.4412E-09	0.0100279	1.40784	0.0757875	0.03342	0.133003	6.7497E-09	4.5678E-09	97.9334969
BG4-007	8	opx	44.0071	11.0602	25.4163	0.644878	15.5533	0.703242	2.5207E-09	0.0150299	0.313065	0.00839135	0.0063005	0.0485786	0.0136542	5.2497E-09	97.7900396
BG4-007	9	sp	0.127118	55.5711	32.108	0.275405	9.52598	2.425E-09	2.4565E-09	0.0015204	0.663141	0.100779	0.0514336	0.154895	0.00439583	4.6195E-09	98.5837678
BG4-008	1	plag	54.1311	28.1086	0.0973747	7.8349E-09	6.2855E-09	10.3702	0.332375	5.17911	0.00784341	1.8064E-08	0.00080617	0.0498824	0.0174457	0.0278064	98.3225438
BG4-008	2	sp	0.0848463	54.1843	30.7361	0.185753	10.6817	0.0365501	2.458E-09	0.0119414	1.2918	0.0129827	0.173924	0.127016	6.7937E-09	0.0836367	97.6105502
BG4-009	1	sp (zn)	6.9684E-09	53.6201	27.1625	0.0424538	8.07896	2.4176E-09	2.4507E-09	2.1586E-09	0.0910429	1.25727	0.445713	6.81898	6.792E-09	4.5913E-09	97.5170197
BG4-009	2	TiMa	5.8513E-09	2.06011	44.6511	0.173683	2.58711	0.00409239	2.2186E-09	0.0142582	43.2379	0.184789	0.0751428	0.346412	0.0337423	6.2106E-09	93.3683397
BG4-009	3	gt	38.8589	21.5349	25.8676	0.512365	9.70888	2.48876	2.5061E-09	2.0184E-09	1.3585E-08	0.00116686	1.5213E-08	0.0133714	0.00679602	5.2791E-09	98.9927393
BG4-010	1	opx	45.3294	7.76285	29.448	0.699077	15.1548	0.227636	2.5082E-09	0.0110392	0.00948473	0.0209842	1.519E-08	0.0583917	6.9516E-09	0.0987406	98.8204035
BG4-010	2	gt	38.7048	21.6376	25.178	0.542745	9.80908	2.51087	2.508E-09	0.0207453	0.00788638	0.0147345	1.5219E-08	0.0484982	0.00056218	5.303E-09	98.4755216
BG4-010	3	opx	40.921	13.0142	28.4572	0.631842	13.6466	0.21664	2.5066E-09	2.0714E-09	0.0190858	1.5869E-08	0.0102511	9.7646E-09	0.00736375	0.124633	97.0488157
BG4-010	4	sp	5.08514	54.3538	29.7973	0.302743	8.79464	0.0628984	2.4746E-09	0.00216088	1.3239E-08	0.0301386	1.5047E-08	0.0976396	6.8428E-09	4.7176E-09	98.5264605
BG4-009	4	plag	47.983	31.541	0.204652	7.8274E-09	0.00366821	14.9537	0.119937	2.76322	1.4682E-08	1.8055E-08	1.5573E-08	1.0095E-08	0.00171832	0.0241834	97.595079
BG4-011	1	sp	0.0987076	51.7392	33.3077	0.19815	9.76163	0.0112738	2.4439E-09	0.00292287	1.40245	0.0446843	1.4939E-08	0.251434	6.7569E-09	4.5767E-09	96.8181526
BG4-011	2	opx	44.9446	10.1881	22.8637	0.445884	17.6136	0.971529	2.5318E-09	0.0356284	0.617002	0.012746	1.5296E-08	0.0184908	7.0108E-09	0.116754	97.8280342
BG4-011	3	sp	0.0665199	52.8922	32.9374	0.234395	9.92942	0.0010427	2.4484E-09	2.127E-09	1.12926	0.0431661	0.0498193	0.116811	0.00941664	4.5869E-09	97.4094506
BG4-011	4	?	46.5972	26.0224	0.26123	7.8352E-09	0.0579266	11.7139	0.329513	0.0787396	0.0243182	1.8064E-08	1.5592E-08	0.0274887	7.1216E-09	0.256643	85.3693591
BG4-011	5	TiMa	0.137407	9.63956	59.0035	0.428555	3.4938	2.2109E-09	2.2564E-09	0.012111	23.2322	0.174657	0.0290779	0.120299	0.0111707	0.0493875	96.3317251
BG4-009	5	corund	7.4319E-09	97.8326	0.951652	7.7522E-09	5.7244E-09	0.00479939	2.6182E-09	0.00997049	0.0259575	0.170725	0.0152434	0.0325255	7.2211E-09	5.9643E-09	99.0434733
BG4-009	6	sp (zn)	6.9465E-09	52.0598	27.5581	0.0519891	7.77805	2.4104E-09	2.4439E-09	2.1852E-09	0.0796697	1.80021	0.530132	7.046	0.00164418	0.110432	97.016027
BG4-009	7	TiMa	0.0570905	8.22389	58.9028	0.102968	3.69091	0.00306366	2.2543E-09	2.7059E-09	22.7034	0.566624	0.186676	0.714132	0.00905034	0.0618342	95.2224387
BG4-013	1	gt	38.4759	21.5343	25.5495	0.561808	9.8138	2.42827	2.5064E-09	0.0122566	0.0156954	0.00210097	0.0252677	0.04346	6.9437E-09	5.2826E-09	98.4623587
BG4-014	1	gt	38.4742	21.6994	25.6992	0.541739	9.87924	2.41146	2.5063E-09	2.0168E-09	0.0338842	0.0210734	1.5214E-08	9.7906E-09	6.943E-09	0.0729673	98.8331639
BG4-014	2	?	25.6709	34.5033	29.6274	0.461977	10.8873	0.276656	2.4916E-09	0.00618641	0.0408064	0.0360411	1.5117E-08	0.124732	0.00223202	0.0382146	101.675746
BG4-014	3	opx	43.5446	10.1711	27.8929	0.710385	14.7343	0.297699	2.5117E-09	2.0594E-09	0.0304076	0.001381	1.5203E-08	0.0601272	6.9601E-09	5.1255E-09	97.4428998
BG4-014	4	?	43.9356	28.5355	3.06747	0.1289	1.02219	13.311	0.134165	0.273946	0.016833	0.00232204	1.5532E-08	1.0056E-08	0.0160659	6.8016E-09	90.443992
BG4-015	1	opx	43.5877	11.6588	26.1875	0.581401	14.6578	0.423416	2.5195E-09	0.00538184	0.0390241	1.606E-08	0.00236105	0.0334763	6.9806E-09	5.1888E-09	97.1768603
BG4-015	2	sp	0.572223	55.3676	33.3702	0.28247	8.33696	0.0335079	2.454E-09	2.1196E-09	0.0553136	0.0419209	1.4969E-08	0.111923	0.0105444	4.553E-09	98.1826628
BG4-015	3	opx	43.2399	12.7427	25.7874	0.618758	14.4984	0.494357	2.5206E-09	0.00548842	0.0675426	0.00232341	1.5237E-08	0.0318142	0.00739695	5.21E-09	97.4960806
BG4-015	5	?	46.2692	25.947	7.40281	0.196395	2.94485	11.0208	0.0664662	0.428678	0.017339	1.7578E-08	1.548E-08	0.0936518	0.0154865	0.0697846	94.4724611
BG4-015	4	plag?	47.0917	30.8913	1.71367	0.085146	0.473525	15.9418	0.00839824	0.474481	0.00451661	1.7969E-08	0.00964608	0.0530539	7.0472E-09	6.9251E-09	96.7472369
BG4-015	6	sp	6.1072	46.7912	32.3646	0.325083	9.43979	0.034532	2.4566E-09	2.1302E-09	0.03462	0.0108316	1.4983E-08	0.0725278	0.00494836	4.5754E-09	95.1853328
BG4-016	1	opx	43.5213	12.5103	24.7492	0.478976	15.737	0.481841	2.5245E-09	0.0235006	0.581031	0.0270503	0.00157641	0.0268283	6.9918E-09	5.267E-09	98.1386036
BG4-016	2	sp	0.101138	54.4986	33.9915	0.169559	8.60992	2.4155E-09	2.4476E-09	0.011032	0.669169	0.0527364	0.0365397	0.356642	6.7688E-09	0.0571821	98.5540182
BG4-016	3	opx	44.0228	10.4898	24.364	0.280304	15.8888	0.832769	2.5221E-09	0.0397768	1.06655	0.0416069	0.0767791	0.0955622	0.00796679	0.0359306	97.2426454
BG4-016	4	plag	46.6836	32.2241	1.36948	0.0626866	0.183236	17.0452	0.0180061	0.516442	0.0441339	0.00389672	0.0136662	1.0067E-08	0.00744096	0.127609	98.2994975
BG4-016	5	?	21.4769	5.53274	32.7424	0.597697	0.498553	4.20263	0.14816	0.105577	3.04309	1.5245E-08	1.4791E-08	0.0872489	0.106907	4.8919E-09	68.5419029
BG4-016	6	TiMa	5.8577E-09	1.72153	48.2038	0.266465	2.44666	2.1649E-09	2.2181E-09	0.028604	42.9388	0.167203	0.060228	0.0155836	0.00543409	0.0285853	95.882893
TA16-001	1	?	21.4061	2.58266	55.9282	7.0442E-09	0.364774	2.60822	2.3374E-09	0.0720286	0.0421865	1.3996E-08	1.30357	0.0253789	0.00793932	3.9243E-09	84.3410573

TA16-001	2	rut	5.3695E-09	0.106633	0.0946995	0.00368022	3.9869E-05	0.0107453	0.00513291	2.1995E-09	98.1008	0.0813337	1.4587E-08	0.0238162	0.0162596	0.00855199	98.4516923
TA16-003	1	opx	45.2844	7.42238	30.0252	0.464084	13.9905	0.456709	2.5048E-09	0.038799	0.148133	0.0178509	0.0133964	0.0633327	0.00961909	5.0751E-09	97.9344041
TA16-003	2	sp	2.61626	48.1596	39.2692	0.142741	6.37629	2.3873E-09	2.4222E-09	2.247E-09	1.60353	0.0268751	0.0208914	0.177967	6.6991E-09	0.116909	98.5102635
TA16-003	3	sp	0.100598	52.8012	37.595	0.16148	6.55591	2.3984E-09	2.4324E-09	2.2057E-09	0.653508	0.040001	1.4888E-08	0.181618	0.00826127	0.0386135	98.1361898
TA16-003	4	opx	41.7547	12.9014	28.472	0.382495	13.1773	0.291494	2.5062E-09	0.0224473	0.585905	0.00620602	1.5186E-08	0.0417083	6.9443E-09	0.0141594	97.649815
TA16-003	5	?	53.7982	17.3888	16.7042	0.349603	0.454376	7.42805	2.5344E-09	0.239539	0.109691	1.699E-08	1.5381E-08	0.0320693	0.0045487	0.0644041	96.5734811
TA16-004	1	sp	2.65697	53.573	33.9684	0.222863	6.99328	0.0175545	2.4522E-09	0.0445844	0.0225134	0.0592379	0.0210104	0.210509	0.00721288	4.5435E-09	97.7971355
TA16-004	2	opx	43.368	11.369	29.4538	0.478512	12.6662	0.367903	2.5055E-09	0.00219489	0.0218979	1.5855E-08	0.00470607	0.0233421	0.00168565	0.0801831	97.8374247
TA16-003	6	?	82.6269	5.79816	4.8906	0.0158276	0.701081	0.0316777	2.6636E-09	1.6609E-09	0.0624492	1.7826E-08	0.00648542	0.053596	0.00358678	0.16905	94.3594137
TA16-005	1	TiMa?	0.15764	9.32466	61.7753	0.27823	1.39689	2.2056E-09	2.2512E-09	0.00967222	23.1833	0.258111	0.00148159	0.107324	0.00903785	4.7994E-09	96.5016467
TA16-005	2	TiMa?	0.00720282	5.68143	60.7095	0.268733	1.86766	2.1904E-09	2.2379E-09	2.7041E-09	29.7776	0.256655	0.0282092	9.1222E-09	6.1652E-09	0.0421828	98.6391728
TA16-002	1	sill	36.0445	60.3733	1.15486	7.7984E-09	0.00673569	0.00733654	2.6409E-09	1.5206E-09	0.0205766	0.0643594	1.5617E-08	0.0292843	7.2996E-09	6.2415E-09	97.7009526
TA16-007	1	gt	38.0391	21.1786	27.9805	0.420788	8.53107	1.8317	2.4986E-09	0.00820278	0.00656659	0.0192282	0.00783872	0.070005	6.9239E-09	0.00440352	98.0980028
TA16-007	2	opx	43.8932	10.8424	30.3338	0.433497	12.4689	0.284751	2.5041E-09	0.0158837	1.3403E-08	0.00136964	0.0252107	9.754E-09	6.9394E-09	0.0894823	98.3884944
TA16-007	3	?	49.837	17.1564	17.2965	0.309364	0.943218	6.92169	2.5283E-09	0.0833824	0.0210325	0.00536647	0.00238048	0.00336155	0.00969195	0.076024	92.6654114
TA16-007	4	opx	40.4895	15.2604	28.1163	0.419966	12.9026	0.398022	2.5086E-09	0.0641189	0.0250894	0.0306487	1.5192E-08	9.7713E-09	0.0368417	0.00105834	97.7445451
TA16-007	5	opx	44.0719	10.9056	28.4621	0.460763	14.1731	0.392172	2.5116E-09	2.0608E-09	0.00650822	1.5935E-08	0.033152	9.78E-09	6.9601E-09	5.1103E-09	98.5052953
TA16-007	6	sill	36.2088	60.7866	1.51152	0.00620498	0.0241244	0.00061772	2.6394E-09	1.5263E-09	0.00461121	0.0531735	1.5591E-08	0.0086095	0.00118052	0.0547248	98.6601666
TA16-008	1	?	62.9517	14.447	11.0141	0.190338	1.30876	2.5353	2.72456	0.337805	0.974669	1.7355E-08	0.0160187	0.00680834	0.0144764	0.0405452	96.5620807
TA16-008	2	sill	36.3856	60.5029	1.0888	7.8003E-09	0.00424259	2.6165E-09	0.00259271	1.5191E-09	1.4444E-08	0.0509374	1.5622E-08	1.0143E-08	0.0165652	0.10713	98.158768
TA16-008	3	sp	3.11466	56.552	32.12	0.142774	7.23089	0.0765708	2.4645E-09	0.00325935	0.0808134	0.0552363	1.5006E-08	0.130345	6.8158E-09	4.6416E-09	99.5065489
TA16-009		gt	37.8249	21.0361	28.2726	0.34527	8.44173	1.65612	2.4977E-09	0.0212955	0.0180627	0.00898039	0.156711	0.0249923	6.9219E-09	5.1291E-09	97.8067619
TA16-009		gt	37.9237	21.1617	28.55	0.380015	8.54612	1.73755	2.4968E-09	2.0689E-09	0.0297971	0.012664	0.0165345	0.0832943	0.00279909	0.106325	98.550499
TA16-009		gt	37.9198	20.9688	27.7598	0.432175	8.34166	1.75726	2.4987E-09	0.0183863	0.0298255	0.0211016	0.178019	0.0150002	0.0169492	0.0517579	97.5105347
TA16-009		gt	38.0027	21.2331	28.4964	0.392329	8.51604	1.80712	2.4971E-09	0.0174919	0.0317815	0.0110598	1.517E-08	0.00331128	6.9196E-09	0.0933306	98.6046641
TA16-009		gt	37.8537	21.3012	28.4897	0.378029	8.54995	1.79603	2.4971E-09	2.0662E-09	0.0213048	1.5954E-08	1.5168E-08	0.0349884	0.014117	5.1377E-09	98.4390192
TA16-009		gt	38.0455	21.262	28.0479	0.392232	8.44421	1.81453	2.4986E-09	0.00768371	0.0284108	0.0168433	1.5172E-08	0.068335	0.00790962	0.00107298	98.1366274
TA16-009		gt	37.9038	21.2031	28.1826	0.379768	8.48465	1.78246	2.4979E-09	0.0143419	0.0373619	0.0407762	1.5173E-08	9.7574E-09	6.9218E-09	0.148375	98.177233
TA16-009		gt	38.3207	21.6081	28.7335	0.397838	8.61101	1.80231	2.4973E-09	0.00081566	0.0223687	0.029276	1.5168E-08	0.0399889	0.00503922	5.1435E-09	99.5709465
TA16-009		gt	38.0236	21.171	28.5079	0.413472	8.52831	1.76737	2.4971E-09	0.0107041	0.0259069	0.0196679	1.5169E-08	9.7544E-09	6.9199E-09	5.1426E-09	98.4679309
TA16-009		gt	39.2402	21.044	28.2634	0.457855	8.11241	1.8675	2.4992E-09	2.0615E-09	0.0367724	1.5991E-08	0.00705504	0.103337	6.9261E-09	5.175E-09	99.1325295
TA16-009		sill	36.0494	60.563	1.40323	7.7951E-09	0.0171746	0.0109194	2.6398E-09	0.0120713	0.0132629	0.0495785	0.0250316	1.0138E-08	7.2964E-09	0.00129579	98.1449641
TA16-009		sill	35.9471	60.6048	1.27643	0.00310358	0.0143355	0.0141502	2.6404E-09	1.5221E-09	0.0128375	0.0343611	0.0185742	1.014E-08	7.2981E-09	6.2332E-09	97.9256921
TA16-009		sill	35.8959	60.269	1.04205	0.00023881	0.0301775	0.0287956	0.00212111	0.0650348	0.011715	0.0542994	1.5617E-08	0.0396215	0.0609246	6.243E-09	97.4998783
TA16-009		sill	36.0926	60.4899	1.11873	7.7997E-09	0.0122985	0.00806354	0.00188533	0.0004	1.4442E-08	0.0584278	1.5621E-08	1.0142E-08	7.3007E-09	6.2429E-09	97.7823052
TA16-009		sill	36.0262	60.4913	1.02119	7.7996E-09	0.00862924	0.00865531	2.6415E-09	0.0016993	0.0132734	0.0620617	1.5617E-08	0.0516845	7.3012E-09	0.0562065	97.7409
TA16-009		?	34.4434	55.0322	0.954393	7.8025E-09	0.0258247	2.6174E-09	2.6427E-09	1.5192E-09	0.0110742	0.0429405	1.5625E-08	0.0051658	0.00591928	0.00392971	90.5248472
TA16-009		sill	35.8475	60.7889	1.07231	7.7999E-09	0.014738	2.6162E-09	2.6414E-09	1.518E-09	0.0167657	0.0558499	1.5621E-08	1.0142E-08	7.3006E-09	6.2428E-09	97.7960637
TA16-009		sill	35.9945	60.4261	1.13478	7.7993E-09	0.0279069	0.00032252	0.0023565	0.00611759	0.0130025	0.0661776	1.5621E-08	1.0142E-08	7.3001E-09	6.2422E-09	97.6712637
TA16-009		sill	36.0175	60.3589	1.18604	7.7985E-09	0.0199301	0.00663808	2.641E-09	0.00451558	0.0040785	0.042903	0.00161387	0.0155036	0.00828158	6.238E-09	97.6659043
TA16-009		sill	35.9177	60.3065	1.39397	7.7934E-09	0.0248624	0.009347	2.6396E-09	0.0188235	0.0115969	0.0555091	0.0386885	0.0516565	0.013007	6.2257E-09	97.8416609
BG2-009	1	bio	35.7407	14.2652	17.1126	7.5613E-09	12.0667	0.0183819	9.29876	0.359667	5.13994	0.0241741	1.5201E-08	0.100007	0.0100002	0.781264	94.9173942
BG2-009	2	bio	35.1194	14.1729	17.415	7.5553E-09	11.8881	0.0317243	9.35653	0.318621	5.16067	0.0165826	1.5191E-08	0.101628	0.00610425	0.70315	94.2904102
BG2-009	4	TiMa	0.908389	13.108	58.0084	7.0373E-09	6.97468	0.0173835	2.2823E-09	0.0121216	16.22	0.0317187	0.0158288	0.290656	0.00662215	4.5115E-09	95.5937998
BG2-009	5	plag	60.4835	25.4545	0.171924	7.8409E-09	0.0162982	6.73731	0.785417	6.94086	0.010752	0.00779134	1.5633E-08	1.0154E-08	0.00820185	0.0437328	100.660287
BG2-009	6	plag	60.3035	25.4727	0.198352	0.00911834	0.012484	6.85108	1.1395	6.74436	0.00380643	0.00025982	1.5628E-08	1.015E-08	0.00233807	0.0643337	100.801832

BG2-009	7	opx	50.524	5.7881	14.1421	0.00329094	26.3991	0.639644	2.5842E-09	0.018161	0.871729	0.00979205	0.00885187	0.0276551	0.0156577	0.0830305	98.5311122
BG2-009	8	opx	49.9409	6.52967	14.5615	0.0435875	26.1068	0.514485	2.5812E-09	0.0209781	1.05486	0.00513032	1.5466E-08	0.0673556	7.1388E-09	5.6616E-09	98.8452666
BG2-009	9	plag	54.7157	27.7384	0.473257	7.8292E-09	0.0809399	10.0381	1.05206	4.87029	0.121854	1.804E-08	0.00404623	1.012E-08	0.00580552	0.144463	99.2449157
BG2-009	10	?	61.4466	18.6998	1.28995	7.8369E-09	0.220197	6.96209	1.37723	0.0668987	1.09876	0.00129634	0.0056745	1.0137E-08	7.2091E-09	0.246244	91.4147406
BG2-016	1	bio	35.6007	14.3925	16.3552	0.00417185	12.6819	2.5466E-09	9.64644	0.255437	5.37552	0.00657311	1.5206E-08	0.14246	0.0138909	0.480037	94.9548299
BG2-016	2	opx	51.2849	3.41938	18.5544	0.0297551	24.4379	0.204489	2.5661E-09	0.0320485	0.794829	0.0110458	1.5402E-08	0.183933	0.00980791	0.0761619	99.0386502
BG2-016	3	TiMa	0.165073	11.9428	59.5026	0.13445	4.20816	0.042326	2.2693E-09	0.0184503	17.2008	0.0730279	1.4363E-08	0.435136	0.0045585	0.0273913	93.754773
BG2-016	4	?	58.0765	20.0318	1.54205	0.0294987	0.219966	7.51359	0.794564	0.0262488	0.844087	1.7998E-08	0.0332335	1.013E-08	0.00525628	6.857E-09	89.1167943
BG4-017	1	sp	0.0418522	53.1923	31.2714	0.0901019	11.2509	0.00451615	2.4547E-09	2.1053E-09	1.09082	0.0897124	0.22038	0.6987	0.00777414	4.6092E-09	97.9584568
BG4-017	2	sp	0.0707788	53.5762	31.0764	0.126703	11.5102	2.4244E-09	2.4558E-09	2.0998E-09	1.24005	0.0782293	0.365192	0.536842	0.011109	4.631E-09	98.5917041
BG4-017	3	olivine	34.5878	0.0994888	36.9933	0.640017	26.1582	0.159245	2.4636E-09	0.00769103	0.0788639	0.00065945	0.024371	0.0285152	6.8211E-09	4.6187E-09	98.7781514
BG4-017	4	TiMa	0.0816621	9.99796	61.4074	0.440142	3.80916	0.00148291	2.2602E-09	0.0327568	19.621	0.134773	0.0449103	0.093487	6.2327E-09	0.204571	95.8693051
BG4-017	5	olivine	34.864	0.124086	35.6035	0.639094	26.7292	0.188063	2.4685E-09	0.01456	0.105248	0.0117132	0.0803034	9.6649E-09	6.8356E-09	4.6629E-09	98.3597676
BG4-017	6	plag	51.0716	29.4675	0.917654	7.821E-09	0.118196	12.9032	0.577945	3.46808	0.121163	1.8011E-08	1.5573E-08	0.0226274	0.0155815	6.8411E-09	98.6835469
BG4-023	1	gt	38.6317	21.736	26.2297	0.521384	9.88594	2.55863	2.5039E-09	0.0180691	0.0282633	0.0311119	0.0229888	0.013563	6.9365E-09	0.313138	99.9904881
BG4-023	2	opx	42.1799	13.3249	29.109	0.637389	12.8295	0.284931	2.5054E-09	0.00288534	0.0490517	0.015519	0.187584	9.7606E-09	6.9432E-09	0.0705577	98.6912178
BG4-024	1	opx	48.1389	5.30194	27.1596	0.681584	16.6301	0.548472	2.5201E-09	0.00465454	0.00432658	1.6061E-08	0.114368	9.8071E-09	6.9839E-09	5.2063E-09	98.5839452
BG4-024	2	sp	0.0927111	59.8187	29.9319	0.26761	8.96022	2.4422E-09	2.4726E-09	2.0415E-09	0.0244767	0.0950277	0.0400286	0.0251671	0.00276506	4.6905E-09	99.2586063
BG4-025	1	plag	49.9665	30.7011	1.12399	0.0548315	0.115624	14.1555	0.115174	2.85601	1.4645E-08	1.8001E-08	1.5568E-08	1.009E-08	0.00172052	6.8624E-09	99.0904501
BG4-025	2	sp	0.0826027	58.2297	30.7341	0.265652	9.27021	0.011565	2.467E-09	2.0622E-09	0.152455	0.0976978	0.0188164	0.107247	0.00780078	4.6571E-09	98.9778467
BG4-025	3	opx	43.96	12.9052	26.1793	0.587617	14.7271	0.550728	2.5204E-09	0.0156953	0.0964483	0.0246996	1.524E-08	0.00506784	6.9825E-09	5.2145E-09	99.0518561
BG4-021	1	plag	49.8205	30.6049	1.11957	0.0234607	0.10645	14.2798	0.346174	2.73908	1.4647E-08	1.8E-08	0.0331292	0.0156529	0.00633266	6.868E-09	99.0950495
BG4-021	2	sp	0.124488	54.9843	31.3593	0.145743	10.9097	2.428E-09	2.4592E-09	0.0155596	0.915139	0.114011	0.00700117	0.187479	0.0094502	0.0220647	98.7942357
BG4-021	3	opx	45.7593	10.3464	21.3679	0.387454	19.0279	0.951236	2.5412E-09	0.0268376	0.547123	0.0111294	1.5328E-08	0.0307753	7.0355E-09	5.4123E-09	98.4560553
BG4-020	1	sp	0.0905702	50.0342	37.0483	0.17087	9.53521	2.3966E-09	2.4306E-09	2.2041E-09	1.27913	0.0149912	0.12148	0.139559	6.7202E-09	4.4512E-09	98.4343104
BG4-020	2	opx	46.5264	8.49281	22.1221	0.387796	18.9224	1.40406	2.5358E-09	0.0747553	0.542421	1.6435E-08	0.00715227	0.0204968	0.00397684	5.4104E-09	98.5043682
TA10-002	7	sp	0.528724	56.1091	32.8715	0.404108	7.92424	0.0129509	2.455E-09	2.1128E-09	0.268158	0.0293613	0.00938382	0.173723	6.789E-09	4.592E-09	98.331249
TA10-002	9	sp	3.85897	53.3981	33.0462	0.477446	7.60161	0.183944	2.4569E-09	2.1174E-09	0.0033634	0.0484556	0.0156526	0.113666	6.7958E-09	4.6157E-09	98.7474076
TA10-004	1	TiMa	0.158603	6.98057	64.116	0.473082	1.67439	2.1994E-09	2.2453E-09	0.00605136	23.7084	0.156256	0.0618125	0.158964	6.1899E-09	4.7648E-09	97.4941289
BG2-011	1	plag	62.9299	25.6472	0.115929	7.8444E-09	0.00210391	5.94705	0.686665	7.27066	0.0164495	1.807E-08	1.5645E-08	0.00700158	7.2534E-09	6.6404E-09	102.622959
BG2-011	2	opx	49.9846	3.20289	25.1192	0.343954	19.6463	0.193127	2.535E-09	1.9935E-09	0.104746	1.6208E-08	1.5283E-08	0.201101	7.0235E-09	5.2528E-09	98.795918
BG2-012	1	gt	37.6674	21.2918	30.2566	1.54275	7.16504	1.94343	2.4845E-09	0.0113118	0.0437075	1.5846E-08	0.0102534	0.00502072	6.8841E-09	5.1632E-09	99.9373135
BG2-014	1	opx	44.5622	10.5709	26.9985	1.32725	14.6373	0.401604	2.5142E-09	0.0148725	0.0511698	0.00161282	1.5214E-08	0.0288305	0.00338192	5.2205E-09	98.5976216
BG2-014	2	sp	0.0871263	58.9591	32.4902	0.690771	7.71785	2.4283E-09	2.4597E-09	2.0929E-09	0.0621152	1.5398E-08	1.4988E-08	0.127063	6.8016E-09	4.6346E-09	100.134226
BG2-014	3	sp	0.095946	58.4114	34.4072	0.707894	6.12592	2.4192E-09	2.4512E-09	2.1293E-09	0.0301262	0.0101076	0.0187508	0.00330868	6.7794E-09	0.0317588	99.8424121
BG2-014	4	opx	46.4653	6.46577	30.2866	1.70132	13.4567	0.599895	2.4998E-09	0.0206842	0.0355528	1.5838E-08	1.5165E-08	9.7465E-09	0.0011211	0.0241209	99.057064
BG2-013	1	gt	37.8244	20.963	29.3684	1.46026	7.1332	1.94712	2.4877E-09	2.0969E-09	0.0452358	1.5887E-08	0.0110495	0.00167521	0.00618957	0.0044239	98.764954
BG2-013	2	plag	48.7913	31.7709	0.952337	0.0859578	0.0789585	15.1649	0.106181	2.40113	0.00103489	1.801E-08	1.5562E-08	1.0084E-08	0.00747527	6.9009E-09	99.3601745
BG2-014	5	opx	44.6785	9.48416	29.5154	1.50597	13.2273	0.472648	2.5027E-09	0.0052909	0.0296664	1.5862E-08	0.0181944	9.7534E-09	0.00621959	0.0372728	98.9806221
TA11-002	1	gt	38.0763	21.5276	28.6996	0.785116	8.13873	2.386	2.4928E-09	0.0146668	0.00606029	0.0247472	0.00869439	0.0320983	0.00901903	0.0497953	99.7584273
TA11-002	2	gt	38.1603	21.5629	28.7918	0.809176	8.09964	2.33737	2.4928E-09	0.0148031	0.0212453	0.0140163	0.00869377	0.0371634	0.00732813	5.1893E-09	99.864436
TA11-002	3	?	24.6471	26.2874	37.8051	0.783645	9.14241	0.286522	2.4495E-09	0.0236572	0.0335063	1.5169E-08	0.00077618	0.125155	0.0144452	0.114522	99.2642389
TA11-002	4	opx?	54.4722	11.2033	27.6084	0.846657	8.96877	0.885354	0.615489	0.245913	0.0242569	1.6208E-08	0.00873729	9.8197E-09	6.995E-09	0.129735	105.008812
TA11-002	5	?	31.2226	30.8721	30.1083	0.827952	9.79156	0.578468	0.262658	0.135041	0.0225195	0.00546096	1.5131E-08	0.0286954	6.9003E-09	5.0189E-09	103.855355
TA11-003	1	opx	44.1645	12.7153	27.6294	0.890249	13.8828	0.347657	2.5142E-09	0.0354208	0.0905992	0.00552344	1.5213E-08	0.0220459	0.00450926	5.1793E-09	99.7880046
TA11-003	2	plag?/ort	49.1491	18.917	11.1996	0.274549	1.6788	1.00173	3.72571	0.887639	0.303801	1.7191E-08	1.5435E-08	0.029262	0.00979333	0.0633428	87.2403272

TA11-003	3	?	4.40337	19.5022	1.84022	0.277161	1.77597	0.736928	0.290735	1.6376E-09	1.4176E-08	1.7398E-08	0.0175819	0.174137	0.00690017	0.998814	30.0240171
TA11-003	4	opx	46.6186	12.5521	21.545	0.569648	18.2613	0.200258	2.5478E-09	0.0853702	0.143928	0.0115784	0.0167682	0.00855308	7.0541E-09	5.3842E-09	100.013104
TA11-003	5	plag?/ort	67.2126	14.4755	6.93257	0.303358	0.975157	1.53223	3.95672	0.59467	0.350834	1.763E-08	1.556E-08	0.0104208	0.011084	6.472E-09	96.3551438
TA11-006	1	sill	36.1164	61.6191	1.28287	7.7968E-09	0.0108105	2.6152E-09	2.6404E-09	1.5214E-09	0.0248159	0.00411312	0.0251394	0.00174621	7.298E-09	6.2289E-09	99.0849952
TA11-006	2	plag?/ort	64.7068	14.8757	8.43943	0.334795	1.0222	2.28885	4.37466	0.65064	0.439107	1.7533E-08	0.0112805	1.0046E-08	7.1524E-09	6.4197E-09	97.1434625
TA11-006	3	opx	44.2696	11.1412	28.2827	0.890746	14.3554	0.343037	2.5112E-09	0.0251064	0.0167452	0.00114706	0.0594423	9.7789E-09	6.9589E-09	0.0537409	99.4388649
TA11-006	4	sp	0.138598	52.9513	36.9795	0.47055	7.89533	2.4031E-09	2.4367E-09	2.1909E-09	0.131866	0.0655168	0.0116862	0.131339	0.0077243	4.4426E-09	98.7834103
TA11-006	5	sp	3.39798	46.7049	36.1158	0.542808	6.39194	0.0518354	0.771341	0.214841	0.381854	0.027154	0.00077263	0.043179	0.0110062	0.0302767	94.6856879
TA11-006	6	opx	41.8819	15.0127	27.8875	0.772045	12.8629	0.326991	2.5105E-09	0.00790337	0.0751938	0.0203104	1.5198E-08	0.0152492	0.00281405	5.1389E-09	98.8655068
TA11-008	1	gt	38.142	21.6947	28.2822	0.839777	8.49712	2.27253	2.4949E-09	0.0198332	0.024707	0.0243117	1.5162E-08	0.103099	6.912E-09	0.0299198	99.9301977
TA11-009	1	qtz	95.8639	0.0843428	0.299784	7.9078E-09	0.0111459	0.0123127	2.6928E-09	0.0190155	0.013421	0.00052313	1.5814E-08	0.0442108	0.0036287	0.0443158	96.3966004
TA11-009	2	opx	42.9916	12.2631	28.5674	0.848033	13.3542	0.39383	2.507E-09	2.0694E-09	0.192812	0.0253909	0.0237585	9.7681E-09	6.9471E-09	5.1347E-09	98.6601244
TA11-009	3	sp	2.46115	53.4268	38.5795	0.508697	5.57734	0.0539005	2.4353E-09	0.104609	0.237283	0.0394251	0.00077294	0.121257	0.0198508	4.4641E-09	101.130585
TA11-009	4	plag	47.3941	28.2714	3.83474	0.186467	0.472681	13.8941	0.449819	0.966026	0.0742095	1.7832E-08	1.5522E-08	1.0046E-08	7.0454E-09	6.7845E-09	95.5435426
TA11-009	5	?	36.333	16.7226	31.973	0.879546	11.9928	0.276088	2.485E-09	0.0137883	0.151837	0.0184299	0.0118249	0.0521963	6.8842E-09	0.115564	98.5406744
TA11-009	6	opx	42.972	11.0688	31.5154	1.0011	10.9059	0.608925	2.4924E-09	0.0247289	0.14975	1.5737E-08	0.0276281	9.7246E-09	6.9077E-09	5.0559E-09	98.274232
TA11-012	1	sill	36.1657	61.2504	1.15973	7.7964E-09	0.0125485	0.00724486	2.6408E-09	0.00070089	0.00643943	1.7875E-08	1.5607E-08	0.132818	0.00236236	0.0860571	98.8240012
TA11-012	2	plag/ort	64.5567	19.4032	0.116295	7.8254E-09	0.00225534	0.531822	10.9376	3.70397	0.0308832	1.8041E-08	1.5583E-08	0.0174207	7.1526E-09	6.7419E-09	99.3001463
TA11-012	3	plag	59.0808	25.687	0.163779	7.8398E-09	6.3043E-09	7.16803	1.0993	6.61218	0.0141226	1.806E-08	0.00486386	0.0104878	7.2168E-09	0.0698919	99.9104552
TA11-012	4	gt	38.3112	21.5604	27.736	0.878636	8.97542	2.09187	2.4977E-09	2.0553E-09	0.0185472	1.6021E-08	0.0427216	0.037213	6.9209E-09	5.214E-09	99.6520078
TA11-012	5	?	0.988416	1.1534E-08	0.0578375	0.176717	7.1544E-09	1.76851	0.00183539	1.9876E-09	1.4714E-08	1.7866E-08	0.00949342	9.7966E-09	0.0176335	1.21909	4.23953287
TA11-013	1	gt	38.3579	21.5528	27.0182	0.915009	8.89158	2.09101	2.5002E-09	0.0143644	0.00025117	0.0180594	1.5183E-08	0.0592388	0.0016815	0.0881392	99.0082335
TA11-013	2	sp	0.140638	55.0442	36.722	0.453739	6.58804	2.4048E-09	2.4384E-09	2.1802E-09	0.594407	0.0442594	0.0288251	0.166269	0.00827683	4.4999E-09	99.7906543
TA11-013	3	opx	43.8794	10.3896	29.1259	1.02007	13.2603	0.415215	2.5039E-09	0.0004115	0.292739	1.5891E-08	1.518E-08	9.7601E-09	6.9392E-09	0.196903	98.5805386
TA11-013	4	plag	48.675	30.6752	1.45123	0.128253	0.103562	14.6316	0.0937429	2.11491	0.0251562	1.798E-08	1.5558E-08	1.008E-08	7.0721E-09	6.8801E-09	97.8986542
TA11-013	5	TiMa	0.256186	8.88472	60.0675	0.721751	2.37839	2.2078E-09	2.2532E-09	0.00770922	22.0483	0.103007	0.0478236	9.1288E-09	0.0131714	0.111071	94.6396292
TA18-001	1	sill	36.2075	61.491	1.26619	0.00525234	0.0173545	0.00191199	2.6405E-09	0.00502008	0.00230702	0.0406709	1.5617E-08	0.017477	7.2983E-09	0.0247927	99.0794766
TA18-001	2	plag/ort	64.7434	19.6555	0.0822643	7.8195E-09	0.00731249	0.224897	13.2842	2.11098	0.0447731	1.8033E-08	1.5565E-08	0.0243532	0.00115156	6.7956E-09	100.178832
TA18-001	3	gt	38.4914	21.6641	26.5207	0.832536	9.64469	1.81491	2.5046E-09	0.0124741	0.0108609	0.0234915	0.0324787	0.0643759	0.0113215	5.2401E-09	99.1233386
TA18-002	1	rut	0.0398143	0.1197	1.26647	0.0119463	7.702E-09	0.0103897	2.1334E-09	2.2096E-09	97.1815	0.0108293	0.0401052	9.3509E-09	0.011009	0.263719	98.9554828
TA18-002	2	TiMa	0.0128967	1.23373	66.6041	0.221915	1.49621	2.1826E-09	2.2295E-09	0.00255893	26.0319	0.14535	0.154822	0.181454	6.1456E-09	4.7758E-09	96.0849366
TA18-001	4	gt	38.4645	21.8387	26.9215	0.826811	9.54712	1.76361	2.5034E-09	0.0158543	1.3516E-08	0.00438825	1.5185E-08	0.147322	0.00168363	5.2218E-09	99.5314892
TA18-003	1	opx	43.8819	11.7864	27.0651	0.858752	14.4331	0.327633	2.5157E-09	2.041E-09	0.0662678	1.6012E-08	0.001579	0.0525919	0.0119295	0.0485592	98.5338124
TA18-003	2	sp	0.219941	57.3454	32.3707	0.402159	8.7096	0.00075022	2.4599E-09	0.00443681	0.0329568	0.0694196	0.0023333	0.0936619	0.00889527	4.6052E-09	99.2602539
TA18-003	3	plag	55.7461	18.2104	15.4131	0.665591	0.76277	6.58226	2.5468E-09	0.359412	0.0560825	1.706E-08	1.5411E-08	9.946E-09	7.0607E-09	6.1123E-09	97.7957156
TA18-003	4	opx	43.5306	12.3545	25.5773	0.76166	15.6411	0.234473	2.5222E-09	0.00623103	0.346243	1.6114E-08	1.5243E-08	9.8124E-09	0.00113051	5.2307E-09	98.4532376
TA18-003	5	sp	0.143987	48.3793	38.3286	0.229275	9.84597	0.00083623	2.4231E-09	0.00146889	1.57108	0.066741	0.140737	0.207307	0.00988738	4.4273E-09	98.9251895
TA18-003	6	gt	38.5251	21.7106	26.7426	0.779254	9.55265	1.6994	2.5048E-09	0.0332111	0.0340671	0.00623973	0.00315365	9.7766E-09	6.9397E-09	5.2279E-09	99.0862756
TA18-005	1	sill	36.0006	61.2841	1.26765	7.7966E-09	0.0295929	0.00460467	2.6403E-09	0.00120183	0.00359444	0.0489048	1.5615E-08	0.0332047	7.2979E-09	6.2311E-09	98.6734534
TA18-005	2	TiMa	0.00150412	1.54717	73.3826	6.9192E-09	0.934521	2.1879E-09	2.2334E-09	0.0115833	19.5277	0.159293	0.182505	0.230769	6.1636E-09	4.3077E-09	95.9776454
TA18-005	3	gt	38.4767	21.7207	26.9692	0.790805	9.57244	1.74859	2.5037E-09	0.00502517	0.00934432	0.02393	1.5193E-08	9.7738E-09	0.00224494	5.2229E-09	99.3189795
TA18-005	4	opx	44.3458	11.1903	27.093	0.838893	14.9389	0.300538	2.5164E-09	2.0392E-09	0.133229	0.00760588	0.0357102	9.7945E-09	6.9722E-09	5.1859E-09	98.8839761
TA18-005	5	plag?	55.3418	16.7918	17.1333	0.681197	1.52426	5.79666	2.5411E-09	0.0812745	0.544415	0.00974991	1.5384E-08	9.9229E-09	0.00341986	6.0312E-09	97.9078763
TA18-005	6	sp	0.47992	55.8491	33.3366	0.391298	8.34894	0.0372387	2.4537E-09	2.1181E-09	0.161117	0.091983	0.0125114	0.123585	6.7853E-09	4.5761E-09	98.8322931
TA18-005	7	plag?	54.8863	16.8575	17.0219	0.70576	1.74112	5.8736	2.5406E-09	0.130935	0.475195	1.6945E-08	1.5382E-08	0.0462456	0.00056987	6.0277E-09	97.7391255
TA18-005	8	sp	10.016	51.7813	29.7643	0.431436	6.97232	0.792218	2.475E-09	0.0352896	0.1208	0.0310881	0.0534451	0.0940943	0.00498518	4.8315E-09	100.097276

TA18-004	1	?	32.3883	10.488	12.188	2.82658	1.82878	3.16803	1.08782	0.0308882	0.344659	1.6725E-08	1.5261E-08	0.0152887	0.0542316	6.0946E-09	64.4205775
TA18-006	1	qtz	97.1734	0.0564917	0.14335	7.9104E-09	6.1021E-09	0.00493814	2.6937E-09	0.00419647	0.0189936	1.8194E-08	1.5819E-08	0.0176892	0.0054441	0.103028	97.5275313
TA18-006	2	gt	38.5122	21.6752	27.6091	0.74734	9.51564	1.71861	2.5016E-09	2.0484E-09	0.00612109	0.0135968	0.0546208	0.00677074	0.010744	0.127363	99.9973064
TA18-006	3	plag/ort	64.8642	19.4905	0.0945748	7.8176E-09	0.00094727	0.209599	13.2813	2.18589	1.4643E-08	1.8029E-08	1.5558E-08	0.123485	0.00980702	0.0561426	100.316446
TA18-006	4	qtz	96.9783	0.0501384	0.0107621	7.912E-09	0.00435291	2.6649E-09	0.00410893	1.5912E-09	0.0254418	1.8203E-08	0.00328343	0.0159233	7.479E-09	0.111721	97.2040319
TA18-006	5	plag/ort	65.0977	19.625	0.106949	7.8199E-09	0.0042254	0.235043	13.2658	2.1555	0.017027	1.8033E-08	0.0008077	1.0096E-08	0.00865395	0.155796	100.672502
TA18-006	6	gt	38.434	21.7057	26.9321	0.772706	9.40412	1.80133	2.5032E-09	0.0095428	0.0234473	0.0113176	1.5188E-08	0.0762037	0.00280572	0.0200194	99.1932925
TA18-006	7	rut	0.0191	0.457638	0.233354	0.0255316	0.0136328	0.00390832	2.1323E-09	2.1988E-09	97.0504	0.0759691	1.459E-08	9.3565E-09	5.9148E-09	0.106536	97.9860699
TA18-006	8	TiMa	6.0768E-09	1.94146	72.5551	0.0375227	1.24851	2.1902E-09	2.2355E-09	0.00540773	18.555	0.354349	0.300943	0.115469	0.0115131	4.2859E-09	95.1252745
TA18-006	9	plag?/ort	61.2716	16.535	10.2107	0.409534	1.63722	2.67047	3.61947	0.562908	0.0590772	0.00500441	1.5494E-08	1.0021E-08	0.00115463	6.2929E-09	96.9821383
TA18-007	1	opx	43.2564	12.4251	28.511	0.893811	12.9967	0.367747	2.5081E-09	2.0692E-09	0.0286468	0.0190966	0.034053	0.0304745	0.00449894	5.1332E-09	98.5675278
TA18-007	2	sp	0.149211	57.9448	33.0009	0.401502	7.50644	0.0119155	2.4574E-09	2.105E-09	0.0056044	0.0389047	0.024251	0.0969144	6.7957E-09	4.5902E-09	99.180443
TA18-007	3	opx	44.2376	10.2873	28.0714	0.900561	14.0405	0.295954	2.5112E-09	0.00135766	0.021138	0.0149048	1.5203E-08	0.00677731	0.00794104	0.0328711	97.9183049
TA18-007	4	plag?	53.6138	17.5381	18.1647	0.730557	1.09191	5.72347	0.427787	0.435485	0.0553187	1.6864E-08	1.5358E-08	0.00684003	0.00970722	0.14282	97.940495
TA18-007	5	plag?	57.4575	16.706	15.0001	0.52775	1.79588	2.48001	2.50526	0.378083	0.0208136	1.7043E-08	0.00720033	9.9562E-09	7.0889E-09	6.0294E-09	96.878597
TA18-007	6	plag?	56.266	15.7181	19.2558	0.644799	2.89435	1.76189	1.96068	0.29078	0.0118297	1.6748E-08	1.5357E-08	0.0359188	0.00057091	5.801E-09	98.8407184
TA10-002	1	qtz	96.9487	0.0708375	0.0990718	7.9093E-09	0.00476668	0.01259	0.00314128	1.5935E-09	0.00949609	1.8194E-08	1.5813E-08	0.0902034	0.0127007	0.205805	97.4573125
TA10-002	2	gt	38.5346	21.805	27.8459	0.844568	8.81024	2.12484	2.4977E-09	2.055E-09	0.0273166	0.0124482	0.0142387	0.0896462	6.9211E-09	0.074456	100.183254
TA10-002	3	sill	36.047	61.5974	1.57992	0.0320043	0.0324482	0.00166841	2.6387E-09	0.00060304	1.4422E-08	0.0696688	1.559E-08	1.0135E-08	0.00295038	0.00911887	99.372782
TA10-002	4	opx/gt	40.0356	15.9549	28.5126	0.855365	14.8139	0.317298	2.5067E-09	2.0565E-09	0.02841	0.0256474	0.0411937	0.00677451	0.00224743	0.031548	100.625484
TA10-002	5	plag?	56.394	17.3477	15.3114	0.633284	1.25762	6.00019	0.580156	0.500772	0.0436587	0.00736523	1.541E-08	0.0583615	0.0063107	6.103E-09	98.1408182
TA10-002	6	plag?	56.2257	15.1344	22.4352	0.876862	3.13596	2.14177	1.37627	0.439847	0.471279	1.6578E-08	0.00555808	0.156776	7.018E-09	5.7073E-09	102.399622
TA10-002	7	sp?	18.1112	43.7692	32.6288	0.403786	5.88375	0.414347	0.218668	0.0631993	0.33232	0.0167965	1.5042E-08	0.0352383	0.00670895	4.8159E-09	101.884014
TA10-002	8	opx	44.4041	10.3268	28.5599	0.947597	14.2324	0.368828	2.5093E-09	0.0167222	0.0208735	0.00916419	1.5195E-08	0.0575826	0.00793539	0.151064	99.1029669
TA10-002	9	sp	6.25253	52.3135	32.889	0.513901	7.90847	0.205389	2.4608E-09	0.0102565	0.0155826	0.0608754	0.0266292	0.204136	6.8072E-09	4.6553E-09	100.40027
TA10-002	10	plag?	56.7778	17.1408	15.025	0.598736	0.675143	6.52457	0.616291	0.48308	0.0602042	1.7096E-08	1.541E-08	0.106426	7.0581E-09	6.1406E-09	98.0080502
BG2-025	1	opx	50.7759	2.20429	26.4046	0.316253	19.7076	0.147556	2.5301E-09	0.0131677	0.339619	1.6155E-08	0.0401224	0.170506	7.0103E-09	0.1112	100.230814
BG2-025	2	opx	50.9033	2.46066	25.9698	0.341312	19.6245	0.128382	2.533E-09	2.0056E-09	0.0812875	0.0197563	1.527E-08	0.285444	0.0022715	5.2317E-09	99.8167133
BG2-025	3	opx	50.9675	2.31963	26.4511	0.348411	19.4263	0.116626	2.5315E-09	0.0129105	0.0525646	1.6141E-08	0.0168271	0.172159	0.0176948	5.2168E-09	99.901723
BG2-025	4	opx	50.6645	2.58812	26.213	0.287114	19.5619	0.129214	2.5324E-09	0.00479927	0.0650402	0.00249013	0.0336623	0.154168	0.0216961	5.2179E-09	99.725704
BG2-025	5	gt	37.836	20.6591	30.4926	1.44107	6.76534	2.26808	2.4821E-09	0.0140282	0.0156703	1.5845E-08	1.5116E-08	0.0162204	6.8779E-09	5.163E-09	99.5081089
BG2-025	6	gt	37.8922	20.7084	30.5857	1.44371	6.74002	2.21509	2.4822E-09	0.0210535	0.0181995	1.584E-08	1.5116E-08	1.5526E-08	0.00500843	0.128746	99.7581275
BG2-025	7	gt	37.926	20.7836	30.4977	1.45497	6.91125	2.33229	2.482E-09	0.0239404	0.00676078	0.00910848	0.0256567	0.0729926	0.00333886	5.1664E-09	100.047608
BG2-025	8	opx	50.8619	2.06351	26.032	0.338378	19.6426	0.114511	2.5329E-09	0.0068188	0.0602036	1.616E-08	1.5275E-08	0.186991	7.0185E-09	5.2267E-09	99.3069124
BG2-025	9	gt	37.6881	20.5444	30.4264	1.47506	6.74155	1.99338	2.4829E-09	0.0217231	0.0144186	0.0141941	1.5115E-08	0.0113538	0.00730213	0.143385	99.0812667
BG2-025	10	gt	37.9754	20.7434	30.5956	1.47599	6.91907	1.92084	2.4835E-09	0.00833673	0.0399143	0.00221774	1.5114E-08	0.0583936	0.00278404	5.1487E-09	99.7419464
BG2-025	11	gt	38.0557	21.057	30.7446	1.43357	6.75532	2.34818	2.4818E-09	0.00569087	0.00241091	1.5847E-08	0.00637946	0.0729854	0.00617702	5.1623E-09	100.488014
BG2-026	1	gt	36.5714	20.2798	29.906	1.47996	7.30919	1.89945	2.4759E-09	0.00768244	2.0235	0.00312303	0.011538	1.5511E-08	0.00166439	0.0208241	99.514132
BG2-026	2	gt	38.4834	21.1421	29.7079	1.55769	7.62863	2.01291	2.4881E-09	0.01429	0.0189555	1.5897E-08	1.5137E-08	1.555E-08	0.00223112	5.1952E-09	100.568107
BG2-026	3	gt	38.0263	20.9677	29.4617	1.57998	7.61456	1.99944	2.4877E-09	2.0949E-09	0.0346509	0.00378692	1.5136E-08	1.5548E-08	0.00787742	5.1964E-09	99.6959953
BG2-026	4	gt	38.1034	20.8519	29.8334	1.54211	7.59311	1.93784	2.4867E-09	2.1011E-09	0.0382128	1.5873E-08	0.0462176	0.0470844	0.0134999	5.1774E-09	100.006775
BG2-026	5	qtz	96.9616	0.0425405	0.0696556	0.00094778	6.0983E-09	0.00488	0.00726301	1.5918E-09	0.0225585	1.8199E-08	0.0093499	1.642E-08	7.4783E-09	0.041548	97.1603433
BG2-026	6	qtz	97.6152	0.0250125	0.252374	0.00307928	0.00033952	0.0105291	2.6932E-09	1.5946E-09	0.017002	1.8187E-08	0.0146894	0.00511093	0.00181463	0.0296381	97.9747895
BG2-026	7	qtz	96.833	0.0392931	0.0433128	7.9104E-09	0.00950651	0.0167702	2.6938E-09	0.0214085	0.0226078	0.00204024	1.5815E-08	0.0749666	0.00363015	0.120058	97.1865939
BG2-026	8	qtz	97.0715	0.0812552	0.191939	0.0151606	0.00719033	0.0304967	0.0147554	0.00519899	0.0130124	1.8191E-08	1.582E-08	1.6417E-08	7.4759E-09	0.0563327	97.4868414
BG2-026	9	?	66.7727	14.5633	3.61518	0.127385	0.344552	5.02534	1.48998	0.0702781	0.0528236	0.00350769	1.5624E-08	1.6196E-08	7.2428E-09	0.154004	92.2190504

BG2-026	10	opx	44.6828	10.6409	28.5189	1.51929	13.8481	0.273415	2.508E-09	2.0716E-09	0.0129962	0.00044626	0.0193301	1.5614E-08	6.9505E-09	0.174619	99.6907966
BG2-026	11	gt	38.1483	20.7333	29.5257	1.54238	7.52592	1.96575	2.4877E-09	0.0200843	0.0217248	0.0057892	1.5135E-08	1.5548E-08	6.8927E-09	0.0515796	99.5405279
BG2-026	12	gt	38.2012	21.1927	29.363	1.55139	7.59363	1.94563	2.4888E-09	0.0172855	0.0796677	1.5906E-08	1.5138E-08	0.0243689	0.00390534	5.201E-09	99.9727775
BG2-027	1	qtz	96.9544	0.0478263	0.169006	0.004975	6.1037E-09	0.0109022	0.00398225	0.0108248	0.00445888	0.00509893	1.582E-08	1.6418E-08	7.4765E-09	0.29434	97.5058144
BG2-027	2	qtz	97.5128	0.0362623	0.0412811	7.9114E-09	6.0994E-09	0.0115985	2.6941E-09	1.5919E-09	0.00798662	0.00790602	1.582E-08	0.0272632	0.00483947	0.208902	97.8588392
BG2-027	3	gt	38.2488	20.9179	29.8801	1.57455	7.53283	1.97328	2.4867E-09	0.00709873	0.0270711	1.5876E-08	1.5127E-08	0.0535801	0.00167243	5.183E-09	100.216882
BG2-027	4	gt	38.3282	21.1169	30.0504	1.56209	7.55692	1.94877	2.4868E-09	0.0111734	0.0178394	1.5872E-08	1.5129E-08	1.5543E-08	6.8903E-09	0.0720721	100.664365
BG2-027	5	spl	0.04717	58.95	32.3583	0.679363	6.79815	0.0271988	2.4591E-09	2.096E-09	0.0172596	1.5389E-08	1.4984E-08	0.131994	0.00440165	4.6337E-09	99.0138371
BG2-027	6	plag	46.7775	32.7777	1.06969	0.12642	0.205162	17.4216	0.013551	0.67881	0.00528247	1.8008E-08	1.5547E-08	1.6094E-08	7.0325E-09	6.9835E-09	99.0757155
BG2-028	1	plag	64.7179	19.0645	0.029175	7.8168E-09	0.00167544	0.100317	14.0399	1.9077	0.0330819	1.8032E-08	1.5554E-08	0.0987949	7.1042E-09	6.8088E-09	99.9930443
BG2-028	2	plag	61.0867	25.0468	0.0222207	0.0176123	6.3176E-09	6.30687	0.591988	7.52479	0.00928453	0.0222697	1.5642E-08	1.624E-08	7.245E-09	6.65E-09	100.628535
BG2-028	3	plag	65.0536	19.1454	1.0228E-08	7.8204E-09	6.1367E-09	0.121674	13.5872	2.14965	0.0130265	1.8038E-08	0.0078876	1.6136E-08	0.00057561	0.141208	100.220222
BG2-028	4	plag	61.2777	25.0383	0.0669932	7.8436E-09	0.0058925	6.2485	0.589321	7.59542	0.0141835	1.8071E-08	1.5641E-08	0.021912	0.00117258	6.6422E-09	100.859395
BG2-028	5	plag	65.4706	19.1928	0.00738318	7.822E-09	6.1473E-09	0.123213	13.1155	2.59952	0.0248075	1.8039E-08	1.5571E-08	1.6142E-08	0.0138571	0.0377771	100.585458
BG2-028	6	plag	65.3818	19.3263	0.0177847	0.00679351	6.1449E-09	0.11256	13.2568	2.47557	0.0258409	1.8038E-08	1.5569E-08	0.0134069	7.121E-09	6.7909E-09	100.616856
BG2-028	7	plag	66.4007	18.9244	0.151512	7.8215E-09	0.0011817	0.111429	12.9458	2.48587	0.0216018	0.00783284	0.0157805	0.00335093	0.00808786	0.145104	101.222651
BG2-028	8	plag	61.2765	25.2088	0.0765927	7.8439E-09	0.00459805	6.2357	0.588	7.54226	1.4628E-08	1.8071E-08	1.5643E-08	1.624E-08	0.00175899	6.6416E-09	100.93421
BG2-028	9	plag	65.7086	19.2935	0.0214899	7.8258E-09	0.00437354	0.243274	11.3071	3.70124	0.0199394	1.8045E-08	0.00789439	0.0469848	0.00753596	0.0432248	100.405157
BG2-028	10	plag	61.304	25.3124	0.0612622	7.8427E-09	0.00550281	6.27814	0.602735	7.59574	0.00831407	1.807E-08	0.0396085	1.6239E-08	7.2453E-09	6.6405E-09	101.207703
BG2-029	1	plag	65.5951	19.3235	0.0361121	7.8272E-09	6.2025E-09	0.252171	10.1215	4.48907	0.0833248	1.8047E-08	1.5592E-08	0.0453417	7.1747E-09	0.0558766	100.001996
BG2-029	2	plag	60.7781	25.3515	0.0558723	7.8422E-09	0.0053417	6.51003	0.631066	7.52581	0.00211758	1.8068E-08	0.0303625	1.6236E-08	0.00644991	0.0747737	100.971424
BG2-029	3	plag	61.2104	25.2209	0.0752366	0.00493284	0.0023009	6.30418	0.652541	7.64754	0.0149562	1.807E-08	1.5641E-08	1.6238E-08	7.2432E-09	0.115551	101.248539
BG2-029	4	plag	66.2675	19.4279	0.0213389	7.83E-09	6.2049E-09	0.364966	9.58186	4.68125	0.0239536	1.8051E-08	0.021074	1.6187E-08	0.00232569	0.244319	100.636487
BG2-029	5	plag	66.1676	20.3876	0.0191559	7.8315E-09	0.00426588	0.787627	8.86252	4.81112	0.0301484	1.8053E-08	0.0158099	1.6192E-08	0.00058203	6.6995E-09	101.086429
BG2-029	6	plag	61.6857	25.001	0.0745712	0.0213687	6.3227E-09	6.11025	0.618933	7.72511	1.4626E-08	1.8071E-08	1.5643E-08	1.6241E-08	0.00586977	0.0422565	101.285059
BG2-029	7	qtz	98.066	0.0483435	0.0237848	7.9121E-09	0.0130548	0.0151172	2.6941E-09	0.00873482	0.0101119	1.8202E-08	1.5822E-08	1.6421E-08	0.0054434	0.393483	98.5840735
BG2-030	1	plag	65.7724	19.4156	1.0245E-08	7.8289E-09	6.1944E-09	0.23369	10.1053	4.43042	0.0234442	1.8051E-08	0.00658389	1.6181E-08	7.1776E-09	6.7153E-09	99.9874382
BG2-030	2	plag	60.9734	25.4612	0.0927095	7.8406E-09	6.3219E-09	6.51802	0.728304	7.44545	1.4627E-08	1.8064E-08	0.0158353	0.0623395	7.2375E-09	6.6477E-09	101.297258
BG2-030	3	plag	61.7521	25.5611	0.040396	0.0157323	0.00232958	6.52584	0.633318	7.43856	1.463E-08	1.807E-08	0.0184837	1.6238E-08	0.00762552	6.6537E-09	101.995485
BG2-030	4	plag	65.1766	19.3724	0.0258631	7.8261E-09	0.00680603	0.15993	10.8041	3.89911	0.0149776	1.8047E-08	0.00658085	1.617E-08	0.0058034	0.117818	99.589989
BG2-030	5	plag	65.7104	19.5707	0.0109185	7.8276E-09	6.1888E-09	0.290625	10.3981	4.18073	0.0167313	0.0111259	1.5594E-08	1.6176E-08	0.0034811	0.183609	100.376421
BG2-030	6	plag	65.9043	19.5611	0.0257105	7.8305E-09	6.1992E-09	0.645399	9.37016	4.46694	0.0401731	1.8053E-08	0.0158069	1.6187E-08	7.1855E-09	6.7153E-09	100.02959
BG2-030	7	plag	60.5226	25.3003	0.0358306	0.0100921	0.00534453	6.90725	1.50307	6.51445	0.017393	0.0156885	0.0395818	1.622E-08	0.00233611	0.154939	101.028876
BG4B-001	1	plag	49.4617	31.2851	0.155326	7.8282E-09	0.0112053	14.3696	0.160772	3.17228	0.00466349	1.8056E-08	1.5574E-08	0.058698	7.0928E-09	0.0924094	98.7717542
BG4B-001	2	crn	7.4317E-09	99.0487	1.03477	0.00162522	0.0034145	2.5951E-09	2.6182E-09	1.4709E-09	0.0192391	0.150471	1.553E-08	0.0200763	7.2209E-09	5.9611E-09	100.278296
BG4B-001	3	TiMa	5.8116E-09	1.08994	46.1374	0.0784772	1.14586	2.1548E-09	2.21E-09	2.5986E-09	47.2319	0.136471	0.0254968	0.00152127	6.0836E-09	6.3306E-09	95.8470663
BG4B-002	1	bio	35.0722	17.7656	14.8049	7.5847E-09	12.1216	0.0216265	9.21541	0.426002	4.79492	0.107289	0.23237	0.132605	0.0351608	0.0643571	94.7940404
BG4B-002	2	bio	34.8582	17.5212	14.8295	7.584E-09	12.1682	0.019648	9.31935	0.411901	4.97269	0.0948355	0.223306	0.103112	0.0345744	0.122364	94.6788809
BG4B-002	3	spl	0.0522423	55.6549	30.9394	0.0747647	11.4612	2.4264E-09	2.4578E-09	2.1002E-09	0.96499	0.228315	0.483611	1.52134	6.7975E-09	4.6262E-09	101.380763
BG4B-002	4	ol	34.541	0.166455	40.4232	0.71182	23.4522	0.158834	2.4495E-09	2.2706E-09	0.131154	0.00275019	0.0229504	1.5351E-08	6.7838E-09	0.0274272	99.6377908
BG4B-002	5	spl	0.117667	51.2477	35.5465	0.236712	9.93348	2.4031E-09	2.4366E-09	2.1747E-09	1.54507	0.114748	0.14215	0.0833738	6.735E-09	0.0804742	99.047875
BG4B-002	6	opx	46.4915	9.95232	21.7135	0.448513	19.2898	0.975272	2.5396E-09	0.00280126	0.674293	0.0726007	0.0908989	1.5786E-08	7.031E-09	5.4227E-09	99.7114989
BG4B-003	1	spl	0.108989	52.9143	28.6266	0.16686	12.2406	2.4265E-09	2.4577E-09	2.0778E-09	2.37745	0.46598	0.763034	0.388758	6.7911E-09	4.7865E-09	98.052571
BG4B-003	2	opx	47.1066	8.18492	18.9166	0.272557	21.5105	0.595854	2.552E-09	0.00036958	1.43059	0.065777	0.115811	0.0941299	0.0109122	0.0661072	98.3707279
BG4B-003	3	TiMa	0.00072627	0.633042	40.9793	0.418242	6.02748	0.0129706	2.2163E-09	2.5375E-09	49.4299	0.0540253	0.23325	1.4726E-08	6.1E-09	6.592E-09	97.7889362
BG4B-003	4	opx	51.1323	5.09927	19.1368	0.334023	22.7841	0.779346	2.5585E-09	0.00737934	0.780312	0.0420055	0.100327	0.0363782	0.0161142	0.155371	100.403726

BG4B-003	5	?	46.8859	23.8989	0.422103	0.00234567	0.0484081	11.097	1.02078	0.0186745	0.0580371	0.0174561	0.0184368	0.0184611	0.00172699	0.171122	83.6793514
BG4B-003	6	spl	0.0958392	52.4703	29.7363	0.171604	12.3401	2.4214E-09	2.4529E-09	2.0931E-09	2.5932	0.520987	0.662021	0.327131	6.7776E-09	4.7731E-09	98.9174822
BG2C-001	1	gt	38.0322	20.5694	30.4084	1.43734	6.90113	1.91032	2.4844E-09	0.0109751	0.00628284	0.00022186	0.0295149	1.553E-08	0.00618265	5.1499E-09	99.3119674
BG2C-001	2	gt	38.3027	20.7239	30.5344	1.44971	6.94347	1.92043	2.4846E-09	2.1116E-09	0.0371607	0.00199731	1.5117E-08	0.0616515	0.0112416	5.1539E-09	99.9866611
BG2C-001	3	opx	50.7098	2.44677	26.6927	0.322078	19.8165	0.149239	2.5303E-09	0.00481085	0.0601966	0.0178841	1.5266E-08	0.183606	0.00912946	5.2061E-09	100.412714
BG2C-001	4	opx	50.5143	2.77762	26.1242	0.339706	19.5732	0.160683	2.532E-09	0.0193133	0.0945405	1.6159E-08	0.0194201	0.162369	0.0108469	0.0309039	99.8271027
BG2C-001	5	plag	66.4768	19.515	0.0535096	7.8195E-09	6.1309E-09	0.147427	13.882	1.8309	0.0230035	1.8035E-08	1.5563E-08	0.0502586	7.1139E-09	6.8084E-09	101.978899
BG2C-001	6	plag	63.3448	25.1589	0.0905735	7.8449E-09	6.3029E-09	5.87423	0.674979	7.20736	0.0260438	1.8068E-08	0.00660369	0.0337214	7.2561E-09	0.0987805	102.515992
BG2C-001	7	opx	45.7493	7.79176	30.3309	1.33884	13.9726	0.396899	2.5021E-09	0.00539288	0.0575146	1.5834E-08	1.5171E-08	1.5586E-08	6.9338E-09	5.124E-09	99.6432065
BG2C-001	8	opx	50.7154	2.80307	26.6453	0.351807	19.3152	0.180864	2.5304E-09	0.00759545	0.0647032	0.00746209	1.5271E-08	0.0737776	0.00798837	5.2165E-09	100.173168
BG2C-002	9	?	0.0238187	1.1483E-08	0.198623	0.0680316	0.0627749	53.7453	0.00643464	0.0120611	1.5193E-08	0.0101341	0.0344027	1.5476E-08	0.00469562	3.59116	57.7574364
BG2C-002	10	?	0.0311239	1.1482E-08	0.182561	0.00209215	0.0449672	54.0037	2.0001E-09	0.0271465	0.0150629	1.8117E-08	0.0101934	0.0418112	0.0183144	3.83616	58.2131327
BG2C-002	11	?	0.0619191	1.1507E-08	0.571857	0.0292271	0.0978635	53.8687	2.0046E-09	0.0665472	0.0191883	1.8091E-08	0.0305772	1.5472E-08	0.0183359	4.27582	59.0400353
BG2C-002	12	opx	51.5478	2.01596	26.3261	0.322669	19.8192	0.210301	2.5324E-09	2.0087E-09	0.0284816	0.00588913	0.0530692	0.26573	0.00283889	5.2263E-09	100.598039
BG2C-002	13	opx	51.1028	2.57348	25.9558	0.284593	19.7794	0.151091	2.5342E-09	0.0060427	0.0782377	1.6181E-08	1.5282E-08	0.139484	7.0216E-09	0.0149055	100.085834
BG2C-002	14	opx	47.2018	5.70017	31.9603	1.65573	13.1355	0.558555	2.495E-09	2.1315E-09	0.0101316	1.5759E-08	0.0411176	0.0178667	0.00676577	0.0348989	100.322836
BG2C-002	15	opx	51.7822	1.63213	26.2026	0.339337	20.0867	0.13206	2.5337E-09	0.0077009	0.0549429	1.6171E-08	0.023307	0.221472	0.00113607	0.0894747	100.573061
BG2C-002	16	spl	0.139269	55.907	36.8003	0.652596	6.24937	2.4071E-09	2.4405E-09	2.1769E-09	0.0275361	0.0220277	0.0215621	0.0784934	0.00436884	4.4869E-09	99.9025232
BG2C-002	17	gt	38.5773	20.7895	30.147	1.34898	7.07275	2.1437	2.4862E-09	2.1023E-09	0.0110296	1.5876E-08	1.5129E-08	0.011365	6.8891E-09	5.1747E-09	100.101625
BG2C-002	18	gt	38.429	20.7829	30.2034	1.3901	7.10059	2.08385	2.4857E-09	0.012519	0.0285973	0.00422496	1.5125E-08	0.0486966	0.00899671	5.1703E-09	100.092875
BG2C-002	19	opx	51.4738	1.92975	26.6617	0.313345	20.0741	0.135645	2.5318E-09	2.0106E-09	0.0365027	0.00723985	1.527E-08	0.204978	0.00056763	5.2133E-09	100.837628
BG2C-002	20	opx	51.7524	2.00151	26.0302	0.324754	20.2186	0.107512	2.5352E-09	0.00855738	0.0281176	0.018393	0.0129541	0.155912	0.018858	5.2385E-09	100.677768
BG2C-002	21	gt	38.0111	20.52	30.2968	1.35549	6.87305	2.37978	2.4824E-09	2.1114E-09	0.0490986	0.00733674	0.0192422	0.1314	0.00055659	5.1697E-09	99.6438541
BG2C-002	22	opx	51.4595	1.95787	26.5089	0.329219	19.6124	0.109741	2.5322E-09	0.0292285	0.0541727	1.6146E-08	0.0116515	0.163989	7.0166E-09	0.00800341	100.244675
BG2C-002	23	opx	47.374	5.52019	31.5267	1.53101	13.52	0.386985	2.4984E-09	0.00771907	0.00306599	1.5776E-08	0.00127936	1.5566E-08	0.00168091	5.1126E-09	99.8726304
BG2C-002	24	opx	51.4692	1.87082	26.871	0.373011	19.6774	0.196203	2.5298E-09	0.0120559	0.041266	0.00791137	1.5261E-08	0.28522	7.0106E-09	5.2117E-09	100.804087
BG2C-003	25	plag	67.3338	19.4451	0.0266934	7.8255E-09	0.00383125	0.131406	11.8598	3.09874	0.00553206	0.00632236	0.0144718	0.0654365	0.00985252	6.7597E-09	102.000986
BG2C-003	26	plag	66.5918	19.3848	0.0139346	7.8257E-09	6.1706E-09	0.209561	11.7207	3.40556	0.0155003	1.8046E-08	1.5581E-08	0.0570459	7.1513E-09	6.7548E-09	101.398902
BG2C-003	27	plag	61.0709	25.2054	0.0294588	7.8441E-09	6.3059E-09	6.77353	0.623393	7.06608	0.00072339	1.8074E-08	1.5641E-08	1.6236E-08	7.2378E-09	0.0608921	100.830377
BG2C-003	28	plag	66.9242	19.4049	0.05323	7.8269E-09	6.1654E-09	0.161513	11.6386	3.30334	0.0231463	1.8047E-08	1.5586E-08	0.00671251	7.1545E-09	0.0794214	101.595063
BG2C-003	29	plag	62.0417	24.8067	0.0521902	7.845E-09	6.3074E-09	6.19778	0.635418	7.23671	0.0308493	1.8075E-08	0.0105645	1.6242E-08	0.0123283	6.6549E-09	101.02424
BG2C-003	30	plag	65.8545	19.0618	1.0236E-08	7.8256E-09	0.0140168	0.107743	12.0256	3.23714	0.0204646	1.8043E-08	1.5582E-08	1.6157E-08	0.0335785	6.7631E-09	100.354843
BG2C-003	31	plag	61.4893	25.1167	0.016161	7.8446E-09	6.3118E-09	6.52791	0.635811	7.35334	0.00206651	1.8074E-08	1.5642E-08	1.6239E-08	0.00058598	0.0763326	101.218207
BG2C-003	32	qtz	99.017	0.0237139	1.0362E-08	7.9125E-09	0.0022185	0.0138944	0.02015	0.00986299	0.00632813	0.00178579	1.5823E-08	1.6421E-08	0.00726024	0.145349	99.247563
BG2C-003	33	qtz	97.6182	0.0596414	0.00577711	7.9123E-09	0.00089376	0.0259445	0.00398322	0.0170365	0.0237007	0.00459183	1.5823E-08	1.6421E-08	0.00242029	0.225267	97.9874563
BG2C-003	34	plag	66.1814	19.4275	0.028054	7.8282E-09	6.1881E-09	0.357565	10.2143	4.10609	0.0308834	1.805E-08	0.027653	1.6178E-08	7.175E-09	6.7259E-09	100.373445
BG2C-003	35	plag	62.2826	24.9841	0.049334	7.8457E-09	0.0069682	6.04294	0.623612	7.19846	0.010833	0.00126659	1.5646E-08	1.6245E-08	0.0123343	6.6501E-09	101.212448
BG2C-003	36	plag	66.6723	19.3772	0.0381348	7.8286E-09	6.1901E-09	0.290779	10.3681	4.20062	0.017868	1.805E-08	1.5596E-08	1.6178E-08	7.1743E-09	0.172174	101.137176
BG2C-003	37	qtz	97.6574	0.0871052	1.036E-08	7.9115E-09	6.0996E-09	0.034392	0.0112428	0.0179891	0.0188232	0.0124973	1.5819E-08	0.0289657	0.0102809	0.358136	98.2368322
BG2C-003	38	plag	61.7927	24.9457	0.0348501	7.8451E-09	0.00235915	6.43379	0.609799	7.20365	0.024353	1.8074E-08	1.5644E-08	1.6241E-08	0.00762854	6.6619E-09	101.05483
BG2C-003	39	plag	66.6206	19.1809	0.054937	7.8289E-09	6.1936E-09	0.298168	10.0786	4.26814	0.0388323	1.805E-08	0.0223881	1.6181E-08	0.00872263	6.7208E-09	100.571288
BG2C-003	40	plag	61.5791	24.7462	0.0414137	7.8449E-09	0.0185569	6.32045	0.623981	7.3243	0.00785172	1.8075E-08	1.5644E-08	1.6241E-08	0.0164296	0.142605	100.820888
BG2C-004	41	plag	65.8897	19.1704	0.0582818	7.8269E-09	6.1892E-09	0.219621	10.6156	4.07205	0.0461658	0.0101133	1.5592E-08	1.6173E-08	7.1676E-09	0.152234	100.234166
BG2C-004	42	plag	61.8651	24.9278	0.0356826	7.8433E-09	6.3112E-09	6.18357	0.715392	7.29835	0.0242956	0.00430565	0.0554569	1.624E-08	7.2468E-09	6.6517E-09	101.109953
BG2C-004	43	plag	61.6264	25.0095	0.0659918	7.8445E-09	0.00280649	6.44708	0.622728	7.23759	1.4632E-08	0.00177283	1.5643E-08	1.624E-08	0.00175838	6.6585E-09	101.015628
BG2C-004	44	qtz	97.3411	0.0425844	0.0100254	7.9126E-09	6.0947E-09	0.0106151	0.00304644	1.5905E-09	1.4692E-08	1.8204E-08	1.5823E-08	1.6422E-08	0.00423622	6.8923E-09	97.4116076

BG2C-004	45	plag	62.4555	25.4131	0.0380496	7.8452E-09	0.0174758	6.21615	0.582348	7.1321	0.0113491	1.8076E-08	0.0158476	1.6244E-08	0.00587222	0.0480439	101.935836
BG2C-004	46	qtz	99.0362	0.0152041	1.0362E-08	7.9126E-09	6.0958E-09	0.0232284	0.00890378	0.0181622	0.022407	1.8204E-08	1.5823E-08	1.6421E-08	0.00605064	0.0727299	99.2028861
BG2C-004	47	plag	65.904	19.2323	0.0349339	7.8266E-09	0.00312567	0.229856	10.8621	3.93306	0.0390991	1.8048E-08	1.5591E-08	1.6171E-08	7.1636E-09	0.0891688	100.327644
BG2C-004	48	plag	61.3283	25.0245	0.0432661	7.8446E-09	6.3099E-09	6.40022	0.564166	7.27411	0.00191123	0.0136663	1.5643E-08	1.624E-08	0.00762864	0.00848088	100.666249
BG2C-004	49	plag	66.4642	21.4589	0.730256	7.8238E-09	0.065482	2.07446	8.00033	4.09285	0.0253194	0.00530137	0.0158001	0.0487062	0.00290625	6.697E-09	102.984511
BG2C-004	50	plag	62.6619	25.1436	0.0326541	7.8438E-09	0.00309334	6.17482	0.71915	7.27152	0.0149068	1.8073E-08	0.0198023	0.048884	7.2488E-09	0.141169	102.2315
BG2C-004	51	plag	61.2385	25.4256	0.067988	7.8415E-09	6.2886E-09	6.62763	1.3291	6.55039	0.0107866	1.8069E-08	1.5632E-08	1.6227E-08	7.2291E-09	6.6852E-09	101.249995
BG2C-004	52	plag	66.2389	19.5236	0.0186386	7.8267E-09	6.1709E-09	0.127158	11.4404	3.5248	0.0872492	1.8047E-08	1.5585E-08	0.0151035	7.1556E-09	0.0317413	101.007591
BG2C-005	53	plag	67.1841	20.0231	0.489995	7.8244E-09	0.208433	0.775695	9.95991	3.7716	0.0425728	1.8026E-08	1.5593E-08	1.6172E-08	0.0122017	0.0258313	102.493439
BG2C-005	54	plag	61.6172	25.5245	0.0188521	7.8436E-09	6.3057E-09	6.60984	0.56579	7.10592	1.4632E-08	0.00379901	0.00528095	0.0471917	7.2427E-09	0.0551645	101.553538
BG2C-005	55	?	62.0452	14.3753	1.3955	7.8396E-09	0.0338259	5.85396	2.13907	0.206208	0.428335	0.00908998	0.0171595	0.0353465	0.00409204	0.232382	86.7754689
BG2C-005	56	plag	67.1558	19.5568	0.0611145	7.8259E-09	6.1522E-09	0.125203	12.0801	2.85457	0.0106967	0.00809108	1.5583E-08	0.00167703	0.0104257	0.0998761	101.964354
BG2C-005	57	plag	62.7795	25.3988	0.0745864	7.8453E-09	6.3064E-09	6.01577	0.609971	7.42304	1.4627E-08	1.8069E-08	1.5646E-08	1.6245E-08	0.0029346	6.6408E-09	102.304602
BG2C-005	58	qtz	99.863	0.0391309	1.0361E-08	7.9123E-09	6.0969E-09	0.00901433	0.00515516	0.0225345	0.0146774	1.8204E-08	1.5822E-08	0.0102247	0.00665503	0.182339	100.152731
BG2C-006	59	opx	50.8106	2.02777	27.5606	0.47579	18.5341	0.141277	2.5254E-09	0.0277695	0.0407322	1.6065E-08	1.5247E-08	0.198065	6.9989E-09	0.00455011	99.8212539
BG2C-006	60	opx	50.4438	2.27716	27.5005	0.431904	18.3058	0.160397	2.525E-09	2.0359E-09	0.069205	1.6063E-08	0.0129274	0.163682	0.0136704	5.1856E-09	99.3790458
BG2C-006	61	bio	35.6366	14.4182	18.223	0.0322447	11.6805	2.5382E-09	9.56973	0.267852	5.1582	0.00353422	0.0591987	0.0847697	6.7893E-09	0.414403	95.5482323
BG2C-006	62	bio	35.5891	14.5623	18.4893	0.022937	11.7195	2.5246E-09	6.86826	0.270604	5.16584	1.6742E-08	0.0167542	0.0424428	0.00836671	0.521468	93.2768727
BG2C-006	63	bio	35.9147	14.3987	18.1502	7.5507E-09	11.8082	2.5384E-09	9.50813	0.376317	5.2793	0.0103739	1.5185E-08	0.110881	0.00721253	0.376993	95.9410075
BG2C-006	64	bio	35.9596	14.7322	18.257	7.5502E-09	11.7307	2.5382E-09	9.55759	0.331197	5.31933	1.6822E-08	1.5184E-08	0.112507	0.0127578	0.618669	96.6315508
BG2C-006	65	?	1.39475	0.585267	1.00105	0.00626855	0.229444	56.4008	0.672033	1.9722E-09	0.151728	1.8072E-08	1.5081E-08	0.0257019	5.8548E-09	8.7649E-09	60.4670425
BG2C-006	66	?	0.339021	13.0326	8.79313	0.0431825	5.98463	1.23446	0.321399	2.1171E-09	14.3358	0.0280955	0.0466419	0.282083	0.0174657	6.7348E-09	44.4585086
BG2C-006	67	?	37.2043	1.47058	20.6961	0.0739503	37.9785	0.169526	0.676763	0.100175	0.571586	1.6457E-08	1.534E-08	0.0528045	0.0148548	0.25208	99.2612196
LKPTAF4-001	1	zn-spl	0.0111664	52.2803	29.6027	0.0290314	7.03568	2.4037E-09	2.4382E-09	2.2287E-09	0.0653346	0.331974	0.69048	8.73505	6.7655E-09	4.399E-09	98.7817164
LKPTAF4-001	2	gt	38.8387	21.3153	27.7884	0.698566	9.60114	1.40915	2.5027E-09	2.0513E-09	0.0244951	0.0207365	0.0437853	0.0847688	0.00168324	0.0285794	99.8553043
LKPTAF4-001	3	gt	38.9523	21.2452	27.7843	0.698905	9.68495	1.27355	2.5039E-09	2.0497E-09	0.00752238	0.00896356	0.0141714	0.0538056	6.9377E-09	0.049162	99.77283
LKPTAF4-001	4	zn-spl	6.9719E-09	53.1096	29.027	0.0432162	6.96959	2.4057E-09	2.4402E-09	2.2225E-09	0.0757875	0.31017	0.714402	9.26453	6.7721E-09	4.4126E-09	99.5142957
LKPTAF4-001	5	TiMa	0.00552469	2.16285	62.9608	0.28042	2.25409	2.1845E-09	2.2319E-09	2.7476E-09	28.3598	0.141359	0.144909	0.545383	0.00547409	4.9723E-09	96.8606098
LKPTAF4-001	6	gt	39.0315	21.1003	27.3857	0.685203	9.68577	1.27947	2.5053E-09	2.0449E-09	0.0218622	1.601E-08	0.0206175	0.0733957	6.9417E-09	0.00228967	99.2861081
LKPTAF4-001	7	zn-spl	6.9617E-09	51.9127	28.2667	0.0348575	6.58898	2.4012E-09	2.436E-09	2.2357E-09	0.086956	1.16185	0.601332	10.0273	6.7613E-09	4.4634E-09	98.6806755
LKPTAF4-001	8	zn-spl	0.0186329	51.604	28.257	0.0459592	6.62688	2.4008E-09	2.4356E-09	2.2378E-09	0.0522484	1.14268	0.575272	10.0951	0.0110753	4.4564E-09	98.4288478
LKPTAF4-001	9	qtz	95.9918	0.0725873	0.175135	7.9103E-09	0.0153303	0.00815875	0.00515386	0.00093512	1.4686E-08	1.8192E-08	1.582E-08	0.00681527	7.4772E-09	6.8834E-09	96.2759157
LKPTAF4-001	10	qtz	99.4273	0.0672484	0.150665	7.9103E-09	0.0118199	2.6643E-09	0.00702724	0.00197426	0.01208	1.8193E-08	1.5819E-08	0.0238527	7.4772E-09	0.120004	99.8219716
LKPTAF4-001	11	sill	36.7998	61.4065	1.66028	0.0032676	0.0345208	2.6137E-09	2.6391E-09	1.5281E-09	0.00030556	0.0373126	1.5591E-08	1.62E-08	0.0005902	6.2188E-09	99.9425768
LKPTAF4-001	12	sill	36.9173	60.8832	1.97914	0.00186629	0.0316424	2.6123E-09	2.6377E-09	1.5341E-09	0.0176806	0.0140068	0.00394767	1.6193E-08	0.0135895	6.206E-09	99.8623733
LKPTAF4-001	13	sill	36.5861	61.0028	1.59745	7.7915E-09	0.0240136	0.00167389	2.6389E-09	1.5293E-09	0.0339045	0.0345581	0.0684936	0.0117782	7.294E-09	6.2194E-09	99.3607719
LKPTAF4-001	14	sill	36.7181	60.7576	1.84857	0.0144804	0.0697032	0.0270441	2.638E-09	0.00700817	1.4417E-08	0.0377846	0.00263197	1.6195E-08	0.0218628	6.2123E-09	99.5047853
LKPTAF4-001	15	qtz	99.1394	0.0906853	0.352893	7.9082E-09	0.0117652	0.00215901	0.0056208	0.00270537	0.00730794	1.8181E-08	1.5818E-08	1.6414E-08	0.0126996	6.8754E-09	99.6252363
LKPTAF4-001	16	?	64.6414	18.0698	6.15831	0.214926	1.12169	1.77456	5.08123	0.336367	0.00300455	1.7675E-08	1.5556E-08	1.6107E-08	7.1822E-09	0.0446288	97.4459164
LKPTAF4-001	17	sill	36.7998	60.6898	1.81393	0.00210011	0.019965	0.0089169	2.6384E-09	1.5316E-09	1.4419E-08	0.0455493	1.5589E-08	1.6197E-08	7.2927E-09	6.2148E-09	99.3800614
LKPTAF4-001	18	sill	36.6028	60.6985	1.22904	0.0245454	0.031004	0.00083765	2.641E-09	1.5218E-09	0.0120437	0.0233258	0.00395551	0.0235693	7.2999E-09	6.2389E-09	98.6496214
LKPTAF4-001	19	?	66.9962	17.0435	5.31121	0.199184	0.924823	1.52625	5.14427	0.47193	0.0277676	1.7737E-08	1.5574E-08	0.0150773	7.2027E-09	6.535E-09	97.6602119
LKPTAF4-001	20	gt	38.9607	21.1763	27.8777	0.671678	9.58579	1.43149	2.503E-09	0.0197613	0.00590535	0.0150188	1.5185E-08	1.5611E-08	0.0175389	0.00457301	99.7664554
LKPTAF4-001	21	gt	38.9664	21.4138	27.6251	0.709209	9.63368	1.36424	2.5041E-09	2.0466E-09	0.0124812	0.0118884	1.5185E-08	0.0619664	6.9383E-09	5.1825E-09	99.798765
LKPTAF4-002	22	TiMa	0.00940824	0.590198	61.4317	7.0157E-09	0.703923	2.1733E-09	2.2221E-09	2.7431E-09	31.8837	0.0990461	0.0494702	1.453E-08	0.0128969	5.1695E-09	94.7803425
LKPTAF4-002	23	zn-spl	0.0139886	49.9097	33.5028	0.0339409	6.41817	2.3881E-09	2.4237E-09	2.2855E-09	0.129995	0.269381	0.580329	7.99575	6.7245E-09	0.00879281	98.8628473

LKPTAF4-002	24	zn-spl	0.0231188	49.331	32.811	7.1677E-09	6.42437	2.3885E-09	2.4245E-09	2.2878E-09	0.151499	0.277856	0.571988	8.50126	6.7257E-09	4.2935E-09	98.0920918
LKPTAF4-002	25	zn-spl	0.00026738	42.4054	41.275	0.00042553	5.36911	2.3526E-09	2.3905E-09	2.4211E-09	0.517028	0.270446	0.56991	6.70058	6.6276E-09	4.0808E-09	97.1081669
LKPTAF4-002	26	TiMa	0.145011	17.2189	69.1791	0.024841	2.53921	2.2456E-09	2.288E-09	2.8067E-09	2.85626	0.260868	0.395666	2.09451	0.00358769	0.109913	94.8278667
LKPTAF4-002	27	qtz	96.4508	0.117787	0.758192	7.9028E-09	0.0327022	0.0100643	2.6905E-09	0.00993803	0.0344763	0.00101758	1.5811E-08	1.6404E-08	7.4682E-09	0.184245	97.5992225
LKPTAF4-002	28	gt	39.0326	20.9901	28.3735	0.660872	9.70825	1.29357	2.5018E-09	2.058E-09	0.0172118	0.0105139	0.0424916	0.0277033	0.0237526	0.0603866	100.240952
LKPTAF4-002	29	sill	36.7625	59.7706	1.62527	7.7943E-09	0.0140262	2.6142E-09	2.6396E-09	0.00129643	0.00127335	0.0220402	1.5593E-08	1.6202E-08	0.00827723	0.0688066	98.2740901
LKPTAF4-002	30	qtz	100.099	0.0907023	0.217243	7.9097E-09	0.0125581	2.664E-09	2.6935E-09	0.00415838	0.01239	0.00484327	0.0106841	1.6417E-08	7.4767E-09	6.8818E-09	100.451579
LKPTAF4-002	31	qtz	98.1845	0.0958908	0.140764	7.9082E-09	0.0131307	0.00031991	2.6934E-09	0.00187166	1.4684E-08	0.0101952	1.581E-08	0.119238	0.0127009	0.134708	98.7133192
LKPTAF4-002	32	qtz	99.3317	0.150736	0.697906	7.9024E-09	0.0211576	0.0130228	2.6909E-09	1.6011E-09	0.00543727	1.8155E-08	0.00934002	0.0646885	0.0078557	6.8558E-09	100.301844
LKPTAF4-002	33	gt	38.5901	21.3876	27.3211	0.66832	9.42842	1.26698	2.5046E-09	2.0468E-09	0.0043821	0.0205183	0.0025632	0.161426	0.00566151	5.176E-09	98.8570711
LKPTAF4-002	34	gt	38.5637	21.0614	28.5041	0.632002	9.41092	1.27419	2.5003E-09	0.00335505	0.0118325	0.0256759	0.0489182	0.00485556	0.00224225	5.1379E-09	99.5431915
LKPTAF4-002	35	zn-spl	0.00550115	49.9989	32.6947	0.0352442	6.45672	2.3898E-09	2.4253E-09	2.281E-09	0.115867	0.289259	0.661464	8.32914	6.7299E-09	4.3077E-09	98.5867954
LKPTAF4-002	36	zn-spl	0.00893554	49.772	32.831	0.0287126	6.41427	2.389E-09	2.4246E-09	2.2837E-09	0.12682	0.285382	0.611913	8.33834	0.00217736	4.3023E-09	98.4195505
LKPTAF4-002	37	zn-spl	0.0178787	47.1621	36.886	0.0125665	5.87474	2.3728E-09	2.4098E-09	2.3468E-09	0.25682	0.312231	0.61973	7.90993	0.00486683	4.2005E-09	99.056863
LKPTAF4-002	38	TiMa	0.0168702	12.9687	74.9148	6.8646E-09	1.92845	2.2294E-09	2.2725E-09	2.8651E-09	3.18455	0.281406	0.426692	1.4708	6.2928E-09	0.0578277	95.2500959
LKPTAF4-002	39	TiMa	0.0280078	10.2847	77.0381	6.8485E-09	1.77533	2.2212E-09	2.2646E-09	2.8931E-09	3.47052	0.311098	0.427008	1.10885	6.2703E-09	3.4418E-09	94.4436138
LKPTAF4-002	40	zn-spl	0.0525165	50.2766	31.7299	0.0737979	6.68124	2.3921E-09	2.4275E-09	2.2688E-09	0.293277	0.400865	0.527622	8.73834	6.7357E-09	0.0957087	98.8698671
LKPTAF4-002	41	zn-spl	0.0323406	40.4867	44.4974	0.0529344	5.13281	2.3408E-09	2.3793E-09	2.4615E-09	0.877159	0.249728	0.594417	6.03707	6.5949E-09	4.0333E-09	97.960559
LKPTAF4-002	42	TiMa	0.110708	19.4582	66.3431	0.0390045	2.82339	2.2524E-09	2.2944E-09	2.7639E-09	4.29363	0.28175	0.372219	2.40607	0.00359653	0.0141175	96.1457855
LKPTAF4-003	43	qtz	98.4963	0.119203	0.0448563	7.9121E-09	6.0958E-09	2.665E-09	0.00304626	0.00269791	1.4691E-08	1.8201E-08	1.5823E-08	1.6421E-08	0.0012103	6.8898E-09	98.6673139
LKPTAF4-003	44	sill	36.3473	59.4728	1.22692	7.7995E-09	0.0166012	0.00468648	2.6415E-09	1.5215E-09	1.4441E-08	0.00802704	1.5622E-08	1.6211E-08	0.00059076	6.2396E-09	97.0769255
LKPTAF4-003	45	sill	36.5784	60.6306	1.19667	7.7993E-09	0.0202945	0.00259187	2.6414E-09	0.0044763	0.0079536	0.0132958	0.0105588	1.621E-08	7.3009E-09	0.0595036	98.5243445
LKPTAF4-003	46	qtz	99.8027	0.0982052	0.0390783	7.9121E-09	0.017445	2.6648E-09	2.6942E-09	0.00674699	0.0259829	1.8201E-08	1.5822E-08	1.6421E-08	0.00544558	0.0549029	100.050507
LKPTAF4-003	47	qtz	98.1109	0.193251	0.0287128	7.912E-09	0.0119019	2.6649E-09	2.6942E-09	1.591E-09	0.00497898	1.8202E-08	1.5822E-08	1.6421E-08	0.00604966	0.207411	98.5632054
LKPTAF4-003	48	qtz	99.821	0.17006	0.0720091	7.9095E-09	0.0014809	2.6643E-09	2.6937E-09	1.5928E-09	0.0127541	0.00764888	1.5813E-08	0.0919958	0.0193557	0.1422	100.338505
LKPTAF4-003	49	sill	36.5378	59.6443	1.33258	7.7974E-09	0.0331236	0.00876819	0.00482287	1.5242E-09	0.00846031	0.0376088	0.00659263	0.0134673	7.2992E-09	6.2368E-09	97.6275237
LKPTAF4-003	50	plag	62.4378	18.4968	0.136495	7.817E-09	0.0336652	0.219234	13.4159	1.9211	0.0454785	1.8028E-08	1.5559E-08	0.01842	7.1036E-09	0.123822	96.8487147
LKPTAF4-003	51	sill	36.4315	59.7552	1.25741	0.0086497	0.014312	0.00523572	2.6412E-09	1.5224E-09	1.4439E-08	0.00475921	0.0197972	1.6209E-08	0.00118139	6.2374E-09	97.4980453
LKPTAF4-003	52	sill	36.5124	60.3198	1.30007	0.00771233	0.0140569	0.00057581	2.6407E-09	0.0069745	1.4436E-08	0.0117837	0.0343015	0.047132	0.0124212	6.2317E-09	98.267228
LKPTAF4-003	53	qtz	98.6549	0.124362	0.0154571	7.9105E-09	0.00841786	0.00266663	0.00304592	1.5919E-09	0.0312189	1.82E-08	0.0467418	0.0221515	0.00847044	0.0296765	98.9471087
LKPTAF4-003	54	sill	36.4681	60.47	1.23562	7.7976E-09	0.0163369	2.6158E-09	2.6411E-09	1.5221E-09	0.00300764	0.00701362	0.0488308	1.6209E-08	7.3003E-09	6.2348E-09	98.248909
LKPTAF4-003	55	sill	36.3075	59.8102	1.35359	7.7969E-09	0.0195456	2.6154E-09	2.6407E-09	0.0220167	0.00677835	1.7866E-08	0.0131958	0.0101001	0.018927	6.2306E-09	97.5618536
LKPTAF4-004	56	plag	64.6504	19.213	0.059358	7.8173E-09	0.00242622	0.223558	13.2987	2.35588	0.0435552	1.803E-08	0.053874	0.0703554	7.1143E-09	0.175717	100.146824
LKPTAF4-004	57	sill	36.7869	60.6394	1.29066	0.00070067	0.0135062	0.0105493	0.00114844	1.5223E-09	0.00147826	0.028088	1.562E-08	1.6208E-08	0.00887311	0.00811599	98.78942
LKPTAF4-004	58	bio	32.9721	16.529	17.4119	7.5418E-09	9.62267	2.5368E-09	9.29033	0.290361	5.08874	0.0267881	0.217344	0.0667925	0.00942105	0.128118	91.6535647
LKPTAF4-004	59	opx	44.0337	14.4142	17.0686	0.0487958	21.2961	0.0300753	2.5641E-09	0.0278227	1.09059	0.0436063	0.221576	0.0496671	7.093E-09	5.5072E-09	98.3247332
LKPTAF4-004	60	spl	0.148713	51.4222	28.8238	7.3588E-09	14.5549	2.4319E-09	2.4628E-09	0.0198341	1.36761	0.174149	0.743451	0.39086	6.8061E-09	4.669E-09	97.6455171
LKPTAF4-004	61	?	70.7369	16.1648	2.89494	7.8205E-09	0.816948	0.481836	4.12641	0.598432	1.71793	1.7909E-08	1.5621E-08	1.6203E-08	7.2593E-09	0.061739	97.5999351
LKPTAF4-004	62	bio?	12.6938	3.85018	33.7521	0.0685907	11.9728	0.0257357	0.146787	0.063509	36.5266	0.102773	0.209399	0.0533488	0.00153778	6.3656E-09	99.467161
LKPTAF4-004	63	?	68.5848	16.5293	4.23671	0.0920542	1.38207	0.754439	4.16094	0.563221	1.44613	1.7813E-08	0.0223874	1.6166E-08	7.2336E-09	0.0141913	97.7862429
LKPTAF4-004	64	spl	0.524932	57.4751	24.5	0.0576869	15.3533	2.4637E-09	2.4922E-09	0.00496722	0.79963	0.0551163	0.483638	0.239119	0.00955356	0.013977	99.51702
LKPTAF4-004	65	bio	32.1854	15.906	16.9775	0.0136136	9.48536	2.5377E-09	9.31926	0.28417	5.01055	0.0256089	0.2173	0.0765497	0.00996867	5.8927E-09	89.5112809
LKPTAF4-004	66	qtz	98.15	0.139528	0.0107031	0.00687121	0.00431483	0.0067203	0.0140582	0.00332102	0.0265537	1.8202E-08	1.5819E-08	0.0340803	0.00605063	6.8911E-09	98.4022013
LKPTAF4-004	67	?	71.8991	14.9906	1.67991	0.0438867	0.404967	0.193641	5.25723	0.721521	0.0375415	1.7991E-08	0.0502006	1.6241E-08	7.2849E-09	0.0143924	95.2929902
LKPTAF4-004	68	qtz	99.3886	0.107668	0.0626901	0.0184808	0.00416112	0.00549323	2.694E-09	0.00321952	0.0163866	1.8199E-08	1.5822E-08	1.642E-08	0.0108897	0.0860331	99.7036222
LKPTAF4-004	69	?	69.1702	16.853	3.36101	0.0486707	1.45756	0.371584	4.5348	0.714129	1.0444	0.00801388	1.5612E-08	0.0100844	0.00528299	0.153358	97.732093

LKPTAF4-004	70	spl	0.204967	48.7129	34.2936	0.209364	13.3815	2.411E-09	2.444E-09	2.1594E-09	0.341956	0.0425166	0.288468	0.231327	0.0188216	0.00603117	97.7314514
LKPTAF4-004	71	bio	34.8092	17.2455	17.8404	0.0163449	9.90454	2.5374E-09	9.36319	0.358646	5.18943	0.0479162	0.142779	0.190699	6.7941E-09	5.89E-09	95.1086451
LKPTAF4-004	72	bio	33.9601	17.0101	17.3464	0.0190733	9.85178	0.00332794	9.38932	0.325565	5.22552	0.0339474	0.225177	0.0586836	6.79E-09	5.9064E-09	93.4489943
LKPTAF4-004	73	?	42.4157	27.3322	16.2775	0.00822747	7.64021	0.0580796	2.65508	0.574226	2.37853	0.0645026	0.377637	0.201079	7.0267E-09	5.7482E-09	99.9829717
LKPTAF4-004	74	spl	0.0803186	55.9355	24.6399	0.0145735	15.9984	2.4601E-09	2.4887E-09	0.0135089	0.685097	0.204451	0.56649	0.370581	0.0072991	4.8045E-09	98.5161191
LKPTAF4-004	75	?	0.099537	10.6492	33.0422	0.0193953	11.6873	2.2337E-09	2.282E-09	2.4358E-09	28.6257	0.073403	0.389193	0.0951456	0.00928883	5.927E-09	84.6903627
LKTA14-002	1	gt	38.6037	20.8191	27.8018	0.993514	8.62551	2.15261	2.4962E-09	0.0176982	0.0214083	0.0230189	1.517E-08	0.0504859	6.917E-09	0.160073	99.2689183
LKTA14-002	2	gt	38.6113	21.0572	27.4342	1.00222	8.59252	2.15379	2.4976E-09	0.00219033	0.031581	0.0132573	0.0450568	0.030954	6.921E-09	0.0161632	98.9904326
LKTA14-002	3	gt	38.6919	21.1594	27.5086	1.04413	8.69217	2.15784	2.4976E-09	0.0188029	0.012011	0.0171124	0.0360466	0.0228086	0.00335984	5.2405E-09	99.3641813
LKTA14-002	4	gt	38.4291	20.4877	27.3351	1.04135	8.49778	2.1447	2.4968E-09	0.0027103	0.0128155	0.0426417	0.01287	0.0651483	0.00959765	5.2391E-09	98.0815135
LKTA14-002	5	gt	38.2609	20.7268	27.4569	1.0739	8.55113	2.16475	2.4961E-09	2.0603E-09	0.0185709	0.0351093	0.0244536	0.0228004	6.9168E-09	0.0242352	98.3595494
LKTA14-002	6	?	53.4385	15.6699	18.0141	0.827445	1.7638	5.31232	0.646839	0.285775	1.66507	0.00354923	0.066195	1.581E-08	0.00626311	0.128737	97.8284934
LKTA14-002	7	opx	43.5886	11.9425	26.5643	0.973575	14.5813	0.32258	2.5134E-09	2.0363E-09	0.939518	0.0159963	1.5217E-08	1.565E-08	6.9623E-09	0.0346319	98.9630012
LKTA14-002	8	gt	38.2088	20.4585	27.4841	0.995969	8.6301	2.18225	2.4959E-09	0.0154957	0.0204962	0.00134667	1.5169E-08	0.081425	6.9166E-09	5.2266E-09	98.0784826
LKTA14-002	9	?	54.8647	15.3328	16.931	0.770758	1.89966	4.12448	1.28883	0.329431	1.55085	1.6939E-08	0.0207927	0.0181266	0.01428	6.0451E-09	97.1457083
LKTA14-002	10	opx	44.5732	10.9984	26.0913	0.987225	15.0367	0.290303	2.5179E-09	2.0271E-09	0.667654	0.0121849	1.5229E-08	0.0474247	0.0136401	5.2608E-09	98.7180317
LKTA14-002	11	opx	42.7122	11.927	27.6242	1.03362	13.8182	0.459344	2.5074E-09	0.0226844	0.588931	0.0204915	0.0335152	1.5621E-08	0.0084964	5.194E-09	98.2486825
LKTA14-002	12	spl	0.681976	51.3125	36.1236	0.517903	6.45893	0.037792	2.4312E-09	2.2017E-09	1.36092	0.0833881	0.1279	0.156731	0.00380741	0.00508762	96.8705351
LKTA14-002	13	?	34.219	0.0194513	0.393101	0.0160753	0.0167056	2.6589E-09	2.6883E-09	1.6098E-09	1.465E-08	1.8124E-08	0.0186456	1.6395E-08	7.4615E-09	0.2908	34.9737789
LKTA14-002	14	TiMa	5.9891E-09	2.4984	61.1364	0.63961	1.90736	2.1833E-09	2.2309E-09	0.0129669	28.4212	0.146287	0.085835	0.057443	6.1467E-09	5.05E-09	94.9055019
LKTA14-002	15	sill	36.6251	61.0972	1.04845	0.00795038	0.0255661	2.6166E-09	2.6418E-09	0.0061563	0.00836363	0.0356416	0.0184797	1.6213E-08	7.3022E-09	6.2458E-09	98.8729077
LKTA14-002	16	sill	36.0881	59.9302	1.1439	7.7997E-09	0.0214638	0.00073305	2.6413E-09	1.5205E-09	0.0223045	0.0336193	1.5621E-08	1.6211E-08	7.3005E-09	0.201287	97.4416077
LKTA14-002	17	opx	43.6949	11.1456	27.8067	1.10757	13.6188	0.573211	2.5084E-09	0.00322809	0.240238	1.5973E-08	1.5199E-08	1.5624E-08	6.951E-09	0.0549219	98.245169
LKTA14-001	18	gt	38.4301	20.4895	27.6164	1.00436	8.53934	2.22088	2.4958E-09	0.012142	0.0133271	0.023932	1.5172E-08	0.0130284	6.9161E-09	5.2318E-09	98.3630095
LKTA14-001	19	plag	65.1445	19.2978	0.0595379	7.8183E-09	6.1333E-09	0.275168	13.9432	1.87212	0.0402708	0.00909762	0.0170853	1.6128E-08	0.0103687	6.8138E-09	100.669148
LKTA14-001	20	qtz	98.7006	0.0905597	0.0412875	7.9119E-09	0.0159637	2.6648E-09	0.00492063	0.0115192	0.0141064	0.0163242	1.5822E-08	1.642E-08	0.00363063	6.8909E-09	98.898912
LKTA14-001	21	sill	36.6913	60.7999	1.1757	7.7978E-09	0.0195243	2.6158E-09	2.6411E-09	1.5214E-09	0.0266393	0.0760068	0.00659178	0.0370357	0.0520495	6.2426E-09	98.8847474
LKTA14-001	22	?	56.7792	15.0104	13.7019	0.663652	1.89091	3.43066	1.83934	0.393846	1.89642	0.0110853	1.5418E-08	0.00495385	0.0149239	6.2011E-09	95.6372911
LKTA14-001	23	?	59.097	16.4776	12.8473	0.627041	1.65573	3.75605	1.98459	0.521168	0.395138	0.0086852	0.00260893	0.00663436	0.00461211	6.1935E-09	97.3841576
LKTA14-001	24	sill	36.6564	60.5988	1.20759	0.00163506	0.0134167	0.00607357	2.6412E-09	1.5213E-09	1.444E-08	0.0421427	1.5621E-08	1.621E-08	7.3004E-09	0.136536	98.6625941
LKTA14-001	25	plag	64.443	19.189	0.0563521	7.8186E-09	0.00422084	0.262453	13.6091	2.06205	0.012094	0.00884396	0.017086	1.6131E-08	7.1084E-09	0.286553	99.9507529
LKTA14-001	26	qtz	97.7209	0.120599	0.0558965	7.9118E-09	0.00486964	0.00949341	2.6941E-09	0.00332327	0.0177357	1.82E-08	1.5822E-08	1.642E-08	7.4784E-09	0.109735	98.0425526
LKTA14-001	27	?	57.6736	16.2545	13.0977	0.624824	1.66999	2.50296	3.66542	0.594007	1.23029	0.00385524	1.5422E-08	0.0397254	0.00057207	6.1964E-09	97.3574437
LKTA14-001	28	plag	64.8567	19.2443	0.0695926	7.8177E-09	0.00387941	0.268615	13.7069	1.94385	0.0242919	1.8032E-08	0.00788356	0.0669927	7.1082E-09	0.119478	100.312483
LKTA14-001	29	sill	36.2426	60.3857	1.13289	7.798E-09	0.0235645	0.00620421	0.00045939	0.0255747	0.0171485	0.0273443	1.5613E-08	0.080808	7.3002E-09	0.113528	98.0558216
LKTA14-001	30	sill	36.7749	60.2956	1.16435	7.7995E-09	0.0132298	2.6164E-09	0.00252715	1.5209E-09	1.4442E-08	0.0356272	0.0224387	1.6211E-08	7.3018E-09	6.2432E-09	98.3086729
LKTA14-001	31	plag	64.6467	19.2816	0.0392434	7.8185E-09	0.00580679	0.277368	13.5375	2.1432	0.0224801	1.8033E-08	1.5561E-08	0.0535999	7.11E-09	0.368958	100.376456
LKTA14-001	32	sill	36.6193	60.1104	1.18009	7.7993E-09	0.0286151	0.00581152	2.6411E-09	0.00338794	0.0181168	0.0755087	1.5621E-08	1.621E-08	7.3E-09	0.267453	98.3086831
LKTA14-001	33	?	59.0586	16.4618	10.7782	0.52669	1.64277	2.35087	4.93951	0.930886	0.893136	1.7355E-08	1.5457E-08	1.5968E-08	7.086E-09	6.3005E-09	97.5824621
LKTA14-001	34	plag	64.0093	20.0938	0.0471274	7.8179E-09	0.00681352	0.269021	13.6253	1.98524	0.0367994	0.00227435	0.0131427	1.6129E-08	7.1073E-09	6.8009E-09	100.088818
LKTA14-001	35	?	60.1212	15.9909	10.9762	0.540054	1.58119	2.5146	4.68671	0.816131	0.874725	1.735E-08	0.0287385	1.597E-08	0.0115062	6.3023E-09	98.1419547
LKTA14-001	36	plag	64.8434	19.3928	0.0325401	7.8191E-09	0.00477596	0.309188	13.7325	2.01377	0.0286396	1.8036E-08	1.5563E-08	0.0134001	7.1079E-09	6.8092E-09	100.371014
LKTA14-001	37	sill	36.6209	59.9238	1.20182	7.7989E-09	0.0197653	0.00036654	2.6415E-09	1.5215E-09	1.4441E-08	0.0155528	1.5618E-08	0.0387245	0.0100583	6.2398E-09	97.8309875
LKTA14-001	38	?	57.123	17.0345	11.521	0.480162	1.85465	2.05309	5.22125	1.01962	0.990231	1.7295E-08	0.0287	0.0215427	0.0114735	0.154298	97.5135172
LKTA14-001	39	plag	65.384	19.5863	0.0426	7.8183E-09	0.00325279	0.256499	14.0547	1.76926	0.0330858	0.0222395	0.0105139	0.00334759	0.004024	0.00730579	101.177128
LKTA14-001	40	?	57.5001	16.9338	11.3538	0.520929	1.70567	2.19649	5.14299	1.02271	0.941658	1.7309E-08	1.5439E-08	0.0248638	7.0709E-09	6.2592E-09	97.3430108

LKTA14-001	41	plag	64.9839	19.4916	0.0293564	7.8198E-09	6.1377E-09	0.224457	13.5166	2.15545	0.0376808	0.00454965	1.5565E-08	0.0150782	7.1134E-09	6.8017E-09	100.458672
LKTA38-001	1	zn-spl	0.00968259	52.466	31.1158	0.0785459	7.66603	2.4068E-09	2.4407E-09	2.1967E-09	0.116261	0.654345	0.179913	5.6837	6.7628E-09	0.0655529	98.0358304
LKTA38-001	2	zn-spl	0.0118312	52.0237	31.8181	0.0407926	7.5741	2.4038E-09	2.4379E-09	2.206E-09	0.241373	0.677893	0.188708	5.43075	6.7544E-09	4.4589E-09	98.0072478
LKTA38-001	3	zn-spl	0.0137463	50.1603	33.6529	0.121908	7.19437	2.3933E-09	2.428E-09	2.2399E-09	0.668238	0.626313	0.163614	5.04706	0.00826757	4.4296E-09	97.6567169
LKTA38-001	4	TiMa	0.0309286	5.69189	48.5272	0.663502	2.31627	2.1858E-09	2.2355E-09	2.6315E-09	33.534	0.232756	0.00485126	0.419468	6.1559E-09	0.0276802	91.4485461
LKTA38-001	5	plag?	52.1061	17.531	19.4808	0.711438	1.90859	6.08391	2.527E-09	0.112599	0.150429	0.0042329	1.5337E-08	1.5801E-08	7.0062E-09	0.0369949	98.1260938
LKTA38-001	6	gt	38.9405	21.1558	26.9308	0.78667	9.40512	2.03186	2.5028E-09	0.00984265	0.0216099	0.0347676	1.5193E-08	1.5622E-08	0.0503372	0.0993822	99.4666896
LKTA38-001	7	plag?	52.6794	17.7258	19.395	0.679235	1.76353	6.30298	2.5275E-09	0.161915	0.0918849	1.6798E-08	1.5339E-08	0.0509917	7.0077E-09	0.148071	98.9988076
LKTA38-001	8	spl?	10.9097	46.176	28.856	0.446874	10.6689	0.0851695	2.479E-09	2.0554E-09	4.6841E-05	0.0851929	0.00381497	0.189549	0.0033285	0.0438579	97.4684336
LKTA38-001	9	spl	0.159577	57.6125	32.3999	0.369514	8.3903	0.0265789	2.4597E-09	2.095E-09	0.0118222	0.0481502	0.016556	0.165908	0.00945017	0.0691547	99.2794112
LKTA38-001	10	opx	43.7066	12.2796	28.5168	0.932175	13.208	0.362088	2.5089E-09	2.0661E-09	0.0330787	0.0162922	0.00513064	0.0277278	0.00281281	5.1429E-09	99.0903052
LKTA38-001	11	gt	39.0382	21.4921	27.083	0.748572	9.42982	1.94361	2.5032E-09	0.00638769	0.0261414	0.0265255	1.5194E-08	1.5623E-08	0.00565804	5.2351E-09	99.8000147
LKTA38-002	12	zn-spl	6.9047E-09	52.3697	31.913	0.0962952	7.43084	2.4035E-09	2.4374E-09	2.2044E-09	0.119038	1.15667	0.192624	5.1066	6.7517E-09	4.4992E-09	98.3847672
LKTA38-002	13	zn-spl	0.0234522	51.5884	31.6175	0.0761298	7.51226	2.4037E-09	2.4376E-09	2.2041E-09	0.10617	1.09303	0.180164	4.97821	0.00546293	0.0657598	97.2465387
LKTA38-002	14	gt	38.8802	20.7973	27.4169	0.76539	9.16249	2.09529	2.4999E-09	0.012075	0.0268867	0.0401871	1.5185E-08	1.5611E-08	0.00280215	0.156664	99.356185
LKTA38-002	15	zn-spl	0.0354567	51.2809	32.4554	0.094018	7.45437	2.3995E-09	2.4337E-09	2.2193E-09	0.287846	1.06776	0.247518	5.07026	0.00054546	0.00096475	97.9950389
LKTA38-002	16	zn-spl	0.0308718	51.0018	32.2924	0.096877	7.33005	2.4E-09	2.4342E-09	2.2184E-09	0.16615	1.0105	0.177531	5.02606	6.743E-09	0.0765126	97.2087524
LKTA38-002	17	zn-spl	0.00701236	51.9577	33.8359	0.138746	6.82426	2.3977E-09	2.4319E-09	2.2239E-09	0.152989	1.16937	0.191647	4.20425	0.0043591	0.0453323	98.5315658
LKTA38-002	18	zn-spl	0.0446347	52.987	33.022	0.193113	6.00653	2.4006E-09	2.4346E-09	2.2078E-09	0.526634	1.04405	0.147928	4.03696	6.7412E-09	0.0711796	98.0800293
LKTA38-002	19	TiMa	5.702E-09	6.76225	19.3956	0.0400264	0.703023	0.529807	2.2067E-09	2.3586E-09	54.0496	0.511076	1.4535E-08	0.245876	6.0777E-09	7.9779E-09	82.2372584
LKTA38-002	20	zn-spl	0.0573679	53.7267	33.2059	0.158901	5.81788	0.00425695	2.437E-09	2.1853E-09	1.37257	0.465434	0.0515984	2.82754	6.7441E-09	4.5675E-09	97.6881483
LKTA38-002	21	sill	36.646	60.3336	1.21237	7.7982E-09	0.016904	0.00515669	2.6409E-09	1.5222E-09	0.00866519	0.098576	0.0131978	1.6209E-08	0.00354372	6.2445E-09	98.3380134
LKTA38-002	22	sill	36.7623	60.8345	1.33506	7.7951E-09	0.0145133	2.6148E-09	2.6401E-09	1.525E-09	0.0213225	0.0824721	1.5587E-08	0.0858354	0.0011809	6.235E-09	99.1371842
LKTA38-002	23	sill	36.67	60.882	1.23687	7.7965E-09	0.0197796	2.6153E-09	2.6406E-09	1.5229E-09	0.00132507	0.0862655	0.00791511	0.0673323	7.299E-09	6.2383E-09	98.9714876
LKTA38-002	24	zn-spl	0.00334672	51.6386	33.763	0.0994655	6.84993	2.3968E-09	2.4311E-09	2.2282E-09	0.115879	1.20847	0.170196	4.49209	6.7333E-09	4.4636E-09	98.3409772
LKTA38-003	25	plag	58.1437	26.5894	0.121091	7.8387E-09	0.00263869	8.65462	0.908528	5.85996	0.0143571	1.8066E-08	0.0131868	0.00336376	0.00174647	6.7375E-09	100.312592
LKTA38-003	26	plag	65.1619	19.5233	0.0265119	7.8217E-09	6.142E-09	0.32866	12.8613	2.32801	0.0440323	0.0136492	0.0184099	1.6142E-08	0.0017293	6.794E-09	100.307503
LKTA38-003	27	plag	58.5082	26.5092	0.0966795	7.8368E-09	0.00554404	8.36181	1.61865	5.6163	0.0114145	0.0030378	1.5611E-08	0.0437316	0.00348931	0.00143393	100.779491
LKTA38-003	28	plag	65.2325	19.4809	0.0365834	7.8224E-09	6.1361E-09	0.311769	12.8678	2.14587	0.0473434	0.00581452	1.5572E-08	1.6143E-08	7.1251E-09	0.0422261	100.170806
LKTA38-003	29	plag	58.3294	26.6473	0.121421	0.00117374	0.0202173	8.33944	1.25254	5.84856	0.00610117	0.00430361	1.5617E-08	1.6205E-08	7.194E-09	0.0972419	100.667699
LKTA38-003	30	plag	64.9775	19.3402	0.0817128	7.8213E-09	0.00369432	0.335584	12.963	2.2453	0.0433095	1.8036E-08	1.557E-08	1.614E-08	7.1214E-09	6.796E-09	99.9903007
LKTA38-003	31	plag	57.2318	25.6563	0.0974947	7.8331E-09	0.0134116	7.97147	2.85017	4.94013	0.0170503	0.0070868	1.5602E-08	0.0268891	7.1668E-09	0.0446358	98.8564383
LKTA38-003	32	plag	63.2925	18.8167	0.0580023	7.8154E-09	6.1646E-09	0.322855	12.9599	2.15002	1.51684	0.0108636	1.5553E-08	1.6117E-08	7.0956E-09	6.858E-09	99.127681
LKTA38-003	33	plag	57.6009	25.8027	0.122896	7.8343E-09	0.00237635	8.1232	2.49871	5.12341	1.4651E-08	1.8061E-08	0.0118602	1.6189E-08	0.00232122	0.0632686	99.3516424
LKTA38-003	34	plag	65.2401	19.3925	0.0176196	7.8222E-09	6.1395E-09	0.367666	12.8992	2.22671	0.0657963	1.804E-08	0.00657306	1.6142E-08	7.1234E-09	0.0756999	100.291865
LKTA38-004	35	plag	65.1171	19.3762	0.0706422	7.8219E-09	6.1571E-09	0.374608	12.1798	2.65315	0.045836	1.8035E-08	0.0262989	0.0620354	0.00462623	0.00290118	99.9131979
LKTA38-004	36	plag	57.7634	26.4078	0.122771	7.8385E-09	0.00400717	8.47999	1.02202	5.94324	0.0063599	0.00936168	1.5618E-08	1.6205E-08	0.00232839	0.0443351	99.8056133
LKTA38-004	37	plag	65.6432	19.7729	0.0320732	7.827E-09	0.00633751	0.45712	11.1667	3.25275	0.0291394	0.00050586	1.5586E-08	0.0151039	7.155E-09	0.0649874	100.440817
LKTA38-004	38	plag	58.1862	26.5831	0.0588504	7.8372E-09	0.00615832	8.25016	1.44671	5.73215	1.4647E-08	1.8065E-08	0.0184554	0.0370101	7.192E-09	0.117312	100.436106
LKTA38-004	39	plag	64.9047	19.3304	1.0237E-08	7.826E-09	0.00143369	0.448496	11.2743	3.19851	0.0627802	0.00075878	0.0381624	1.6161E-08	7.1503E-09	6.762E-09	99.2595411
LKTA38-004	40	plag	58.1575	26.1946	0.0639062	7.8387E-09	0.015502	8.28284	1.30544	5.77344	1.4648E-08	1.8068E-08	0.00659219	0.0117776	0.0110809	0.207314	100.029993
LKTA38-004	41	plag	65.4565	19.9479	0.0607955	7.8276E-09	6.1681E-09	0.545757	10.7767	3.37984	0.0314602	0.00505819	0.0052643	1.6168E-08	7.1601E-09	6.7485E-09	100.209275
LKTA38-004	42	plag	58.5619	26.4866	0.0921513	7.8376E-09	0.0110217	8.17533	1.65942	5.67435	0.00160308	1.8065E-08	1.5614E-08	0.0134577	7.1904E-09	0.011462	100.687296
LKTA38-004	43	plag	65.1178	19.3287	0.0543747	7.8231E-09	0.00873532	0.383329	12.1217	2.73978	0.0358633	1.8038E-08	0.00394446	0.0452737	7.1361E-09	0.141959	99.9814595
LKTA38-004	44	plag	58.455	26.5864	0.0933423	0.00633736	0.0091625	8.21886	1.37274	5.69025	1.4646E-08	0.00253181	1.5618E-08	1.6205E-08	0.00875055	6.7365E-09	100.443375
PTAF3-001	1	TiMa	0.0221111	3.01717	71.3113	0.379719	1.23819	2.1924E-09	2.2376E-09	2.8298E-09	18.9074	0.39976	0.156552	0.32051	0.00149882	4.3554E-09	95.7542109

PTAF3-001	2	?	25.1	52.1875	12.795	0.107499	3.42787	2.5305E-09	2.5595E-09	1.7944E-09	1.01041	0.226805	0.191763	2.42611	7.0825E-09	0.0500515	97.5230085
PTAF3-001	3	zn-spl	0.0224496	49.1989	36.7633	0.234888	5.19342	2.3771E-09	2.4134E-09	2.3048E-09	1.32409	0.439025	0.478866	5.41554	6.6853E-09	4.3669E-09	99.0704786
PTAF3-001	4	TiMa	0.0219367	1.34896	50.4191	0.270683	1.49051	0.0027528	2.218E-09	0.00017266	40.3462	0.361005	0.122332	0.368985	6.1068E-09	5.8949E-09	94.7526372
PTAF3-001	5	zn-spl	0.0316261	54.7179	31.6908	0.171018	5.71511	2.4042E-09	2.4384E-09	2.2107E-09	0.54551	0.288017	0.517213	6.31931	0.0182552	0.0393294	100.054089
PTAF3-001	6	TiMa	5.937E-09	0.700033	60.4278	7.0252E-09	0.941848	2.173E-09	2.2222E-09	2.7311E-09	33.2113	0.2377	0.164159	0.131325	0.00148572	0.10891	95.9245607
PTAF3-001	7	zn-spl	6.9611E-09	51.4045	28.0392	0.227403	6.59864	2.3983E-09	2.4333E-09	2.2517E-09	0.0724498	1.19296	0.879035	10.6404	6.7559E-09	4.4587E-09	99.0545878
PTAF3-001	8	zn-spl	6.9857E-09	52.5895	26.6171	0.113966	6.19364	2.4031E-09	2.438E-09	2.2362E-09	0.0570463	1.1798	0.83178	11.5221	0.0133061	0.201976	99.3202144
PTAF3-001	9	zn-spl	0.00137702	53.2963	27.185	0.163663	6.27114	2.4035E-09	2.4382E-09	2.2337E-09	0.0980405	1.15415	1.02529	10.9113	6.7699E-09	4.4882E-09	100.106261
PTAF3-001	10	sill	37.2852	61.0341	1.37698	7.7964E-09	0.00949636	2.6152E-09	2.6405E-09	1.5249E-09	0.0121423	0.0376028	1.5591E-08	0.0521803	0.00295269	0.0567592	99.8674137
PTAF3-001	11	?	25.4358	54.7278	12.1462	0.151959	3.32042	2.5363E-09	2.565E-09	1.7708E-09	0.993061	0.215676	0.16628	2.24005	0.00461226	5.6237E-09	99.4018583
PTAF3-001	12	zn-spl	0.00307727	52.2705	26.6589	0.134569	6.18305	2.4022E-09	2.4371E-09	2.2414E-09	0.0526281	1.15928	0.934643	11.4854	0.00665211	4.4725E-09	98.8886995
PTAF3-001	13	gt	38.8694	21.0374	27.7426	1.31208	8.81275	1.78045	2.4976E-09	2.0616E-09	0.0300419	0.0136779	0.0553292	0.0830507	0.00564747	5.2324E-09	99.7424272
PTAF3-001	14	gt	38.766	21.2295	27.7103	1.31559	8.95314	1.64824	2.4987E-09	2.0585E-09	0.016103	0.0182246	0.0218831	1.5597E-08	6.9238E-09	0.0253715	99.7043522
PTAF3-001	15	zn-spl	0.0142872	52.7627	27.0262	0.0602542	6.20163	2.404E-09	2.4389E-09	2.2372E-09	0.0463093	0.60187	0.905535	11.4693	6.7745E-09	0.00400699	99.0920927
PTAF3-001	16	zn-spl	0.00101138	52.7142	27.1379	0.0891838	6.17295	2.4036E-09	2.4385E-09	2.2388E-09	0.0686525	0.612972	0.963563	11.3141	0.00219195	4.4277E-09	99.0767246
PTAF3-001	17	gt	38.8176	21.0752	27.8259	1.30635	8.93771	1.68753	2.4981E-09	0.0117414	0.0127457	0.0121025	1.5169E-08	0.057	0.0124262	5.2254E-09	99.7563058
PTAF3-001	18	rut	5.3711E-09	0.145805	0.226133	0.00674867	7.6769E-09	0.0124692	2.1309E-09	0.00473632	97.135	0.0971131	0.00492615	1.4952E-08	5.9114E-09	1.0269E-08	97.6329315
PTAF3-001	19	TiMa	0.0145949	0.211528	36.2451	0.833278	2.48855	2.1315E-09	2.1948E-09	0.017626	66.1404	0.087275	1.4444E-08	0.00765337	0.0132396	7.39E-09	106.059245
PTAF3-001	20	rut	5.3752E-09	0.33839	0.214347	0.00134963	7.6778E-09	0.0159764	0.0053773	2.2002E-09	97.4156	0.14627	0.0184736	0.0589736	5.9139E-09	0.0882902	98.3030478
PTAF3-001	21	TiMa	6.1002E-09	2.58093	74.3547	0.100533	0.85181	2.1927E-09	2.2374E-09	2.8616E-09	16.1615	0.660145	0.186336	0.268781	0.0100245	4.1578E-09	95.1747595
PTAF3-001	22	TiMa	5.9666E-09	1.66338	61.196	0.00041976	0.724431	2.1782E-09	2.2262E-09	0.0130648	29.613	0.535429	0.118294	0.0890318	0.00545853	0.047477	94.0059859
PTAF3-001	23	rut	5.3765E-09	0.373602	0.485319	0.0105706	0.00749088	0.0031656	2.1324E-09	0.00689067	97.5082	0.101981	1.4588E-08	1.4952E-08	0.00287129	1.024E-08	98.5000911
PTAF3-001	24	gt	38.5101	21.1151	27.4702	1.28157	8.88545	1.75124	2.4983E-09	0.0181816	0.0175982	0.0152533	0.0437581	0.0651537	6.9226E-09	0.131522	99.3051269
PTAF3-001	25	gt	38.4425	20.7349	27.6989	1.28775	8.83317	1.62262	2.4975E-09	0.0210711	0.0104094	0.0411958	0.0218735	0.0651312	6.9205E-09	0.132368	98.911889
PTAF3-001	26	?	24.0146	30.5737	30.6295	1.10058	11.399	0.156636	2.4776E-09	0.00165351	0.0214581	0.0344461	0.0281648	0.262338	0.00221991	4.8532E-09	98.2242964
PTAF3-001	27	opx	43.8932	12.5353	27.002	1.33703	14.4543	0.300081	2.5146E-09	2.0411E-09	0.0461601	0.0219074	0.0103241	0.0604429	6.9672E-09	5.2156E-09	99.6607455
PTAF3-001	28	opx	40.9215	17.2455	26.0017	1.19545	13.225	0.194746	2.5167E-09	2.0246E-09	0.0115347	1.604E-08	0.0116149	0.140557	0.00282052	5.2068E-09	98.9504231
PTAF3-001	29	spl	0.0930877	54.2248	34.0504	0.570847	8.84107	0.00089385	2.4463E-09	2.151E-09	0.0849058	0.0769373	0.0824318	0.852077	6.7676E-09	0.0233833	98.9008338
PTAF3-003	1	bio	34.718	17.2808	17.0792	0.0411091	10.2213	2.5395E-09	9.29189	0.310335	5.2856	0.101729	0.353957	0.127212	0.0949508	0.205205	95.1112879
PTAF3-003	2	plag?	62.5963	16.3715	7.07149	0.223054	1.30211	3.18439	4.75855	0.296648	1.79361	1.7627E-08	1.5514E-08	0.0133367	0.116628	0.195399	97.9230157
PTAF3-003	3	opx	46.6175	9.8854	17.6795	0.703411	22.2994	0.262188	2.5588E-09	1.8663E-09	1.10052	0.0827817	0.217507	0.0677996	7.0797E-09	0.0386774	98.9546847
PTAF3-003	4	bio	35.2646	17.0216	16.1799	0.0459447	10.7296	0.0234679	9.519	0.183084	5.56139	0.0548544	0.351734	0.122452	0.0488913	0.544954	95.6514723
PTAF3-003	5	spl	0.0843107	41.9851	40.4269	0.223008	10.2171	2.3655E-09	2.4022E-09	2.3339E-09	1.78911	0.140155	0.814399	1.50718	6.6442E-09	4.2767E-09	97.1872627
PTAF3-003	6	bio	34.6112	16.6169	17.4275	0.0420116	10.4593	0.00784868	9.48281	0.111441	5.47571	0.0819506	0.262516	0.0358662	0.0687532	0.53179	95.2155973
PTAF3-003	7	opx	49.5854	5.37641	17.6857	0.518749	23.6807	0.282388	2.5643E-09	1.8617E-09	0.921366	0.0114822	0.206038	0.00993328	0.0121083	5.5586E-09	98.2902748
PTAF3-003	8	bio	35.8512	17.4023	14.2023	0.00821468	12.51	2.5501E-09	9.17615	0.142479	6.29455	0.0917564	0.386136	0.0425728	0.073572	0.73513	96.9163609
PTAF3-003	9	bio	35.1323	16.862	17.1702	0.00655808	10.188	2.5402E-09	9.36778	0.241294	5.28659	0.0753432	0.348851	0.0994889	0.0844028	0.117386	94.980194
PTAF3-003	10	spl	0.10359	44.6913	38.4443	0.141803	10.9938	2.3769E-09	2.4124E-09	2.2786E-09	2.37208	0.0958794	0.84242	1.17359	0.0147858	4.3938E-09	98.8735482
PTAF3-003	11	?	42.0813	19.8399	8.08065	0.0184982	1.34888	1.34113	0.647192	0.0524759	1.07953	1.7319E-08	0.0366553	1.6019E-08	0.0284865	6.1661E-09	74.5546979
TA12-001	1	zn-spl	6.9311E-09	52.4129	31.0069	0.0838391	6.614	2.3999E-09	2.4345E-09	2.2361E-09	0.0945049	0.774152	0.657526	7.69118	0.00940104	4.428E-09	99.3444031
TA12-001	2	zn-spl	6.9281E-09	52.1262	31.0901	0.0927826	6.72415	2.3992E-09	2.4338E-09	2.239E-09	0.119421	0.763589	0.709708	7.61778	0.00273058	0.0729945	99.3194557
TA12-001	3	TiMa	0.0191744	6.07706	32.7083	0.484889	1.4155	0.245237	2.2219E-09	2.4946E-09	43.9241	0.483171	0.00366217	0.155154	6.1154E-09	6.8224E-09	85.5162476
TA12-001	4	gt	38.7107	21.46	27.6176	1.04286	8.94152	2.25146	2.4973E-09	2.0535E-09	0.0099641	0.0184889	1.5174E-08	0.0879761	0.00279948	5.2421E-09	100.143369
TA12-001	5	gt	38.6829	21.4659	27.4492	1.03372	8.86801	2.139	2.4984E-09	0.00900066	0.00190706	0.0123637	0.0167359	0.0814716	6.923E-09	5.2402E-09	99.7602089
TA12-001	6	zn-spl	0.0182486	53.9205	29.1309	0.0774828	6.89915	2.4097E-09	2.4436E-09	2.1998E-09	0.0835044	0.607968	0.721937	7.59069	6.7765E-09	4.4772E-09	99.0503808
TA12-001	7	zn-spl	0.0214692	53.6497	29.8612	0.0995379	6.97065	2.4072E-09	2.4413E-09	2.2095E-09	0.0684398	0.565499	0.738084	7.51054	6.7701E-09	4.4559E-09	99.4851199

TA12-001	8	?	12.5975	45.9738	30.372	0.667806	10.0585	0.0959519	2.4756E-09	0.00896392	0.0539234	0.0619466	1.5056E-08	0.0841829	0.0005541	0.0364298	100.011559
TA12-001	9	?	55.1433	15.6612	16.2275	0.734477	1.7298	3.5702	2.91804	0.654887	1.16526	1.6994E-08	0.0142969	0.0164835	7.0222E-09	6.0656E-09	97.8354444
TA12-001	10	opx	42.2911	11.9729	27.4921	1.1028	13.9731	0.378651	2.5096E-09	0.0148024	0.0158538	0.00692796	1.5198E-08	1.5624E-08	0.0090713	5.1581E-09	97.2573065
TA12-001	11	spl	0.225506	56.0145	34.4172	0.568323	7.16932	0.00340828	2.4476E-09	2.1412E-09	0.365396	0.0132585	0.0520901	0.130054	0.00996541	4.5612E-09	98.9690213
TA12-001	12	opx	46.1306	9.0929	29.0371	1.24587	13.884	0.514965	2.5078E-09	0.016775	0.0144409	0.0267696	1.5194E-08	1.5617E-08	6.9507E-09	5.1767E-09	99.9634205
TA12-001	13	?	55.3058	15.8119	19.8262	0.950738	0.755047	4.19514	1.68331	0.591191	0.107371	1.6763E-08	0.0207475	0.0279381	7.0092E-09	5.8861E-09	99.2753826
TA12-001	14	spl	3.86941	55.4462	32.3153	0.578484	8.64329	0.0310151	2.464E-09	2.0894E-09	0.00534231	0.0933476	1.5006E-08	0.0983904	6.8139E-09	0.138006	101.218785
TA12-001	15	spl	7.34596	52.8176	32.8195	0.61943	8.12561	0.0517791	2.4646E-09	0.00337406	0.0130549	0.086925	0.0204052	0.200014	0.00165487	0.00525654	102.110564
TA12-001	16	plag	64.9182	19.3579	0.0842015	7.8191E-09	0.00697869	0.300605	13.629	2.05435	0.0169539	1.8033E-08	1.5564E-08	0.00502244	0.00057525	0.0655757	100.439363
TA12-001	17	?	43.6673	19.232	8.73839	0.0127144	1.74211	1.55873	0.295681	0.00792723	0.369551	1.727E-08	0.0406004	0.00833024	0.00524234	6.0993E-09	75.6785766
TA12-001	18	plag	64.3023	19.0903	0.0142581	7.8196E-09	0.00266964	0.331476	13.4892	2.20918	0.0106494	1.8037E-08	1.5564E-08	0.0150766	7.1099E-09	6.8051E-09	99.4651098
TA12-001	19	gt	38.7632	20.8801	28.0246	1.05744	8.96997	2.10413	2.4964E-09	0.00916424	0.0070468	0.0107678	0.0102969	1.5594E-08	0.0203209	5.2219E-09	99.8570367
TA12-001	20	gt	38.7908	21.4661	27.7883	0.993006	8.89342	2.10109	2.4975E-09	0.0207384	0.0244022	0.0189313	0.02059	0.146601	0.00790649	5.2263E-09	100.271885
TA12-002	21	plag	58.4321	25.7285	0.0820587	7.8374E-09	6.2791E-09	7.5248	2.06807	5.78238	0.0185386	1.8064E-08	1.5615E-08	1.6202E-08	0.0122439	0.0900878	99.7387791
TA12-002	22	plag	64.8422	19.4571	0.0577029	7.8193E-09	0.00810913	0.326797	13.3991	2.22419	0.00025857	0.0250176	0.0144598	1.6134E-08	0.00115105	0.0829641	100.43905
TA12-002	23	plag	59.2298	26.0315	0.0733364	7.8397E-09	0.0149843	7.64197	1.32851	6.28106	0.0426941	1.8067E-08	1.5621E-08	0.015148	0.00467266	0.0456263	100.709302
TA12-002	24	plag	64.7276	19.3368	0.0800021	7.8186E-09	6.1464E-09	0.335832	13.3539	2.28766	0.0240318	1.8032E-08	0.0433778	1.6133E-08	7.1129E-09	6.7963E-09	100.189204
TA12-002	25	plag	58.9343	25.7022	0.0482619	7.838E-09	6.2864E-09	7.63151	1.81919	6.00087	1.4645E-08	1.8066E-08	0.0316452	1.6206E-08	0.00466701	0.118546	100.29119
TA12-002	26	plag	64.8164	19.4695	0.0362372	7.8203E-09	6.1439E-09	0.352562	13.2037	2.33028	0.0459964	0.0209766	1.5567E-08	1.6136E-08	7.1159E-09	0.087306	100.362958
TA12-002	27	plag	58.8077	26.1779	0.103905	0.015483	0.0224935	7.6396	1.52072	6.24192	1.4639E-08	0.00278404	0.0316393	0.0386987	7.2005E-09	0.123919	100.726763
TA12-002	28	plag	64.5416	19.3971	0.0104001	7.8198E-09	6.1479E-09	0.372356	12.9966	2.42395	0.012869	1.8036E-08	0.0657361	1.6138E-08	7.1189E-09	6.7916E-09	99.8206113
TA12-002	29	plag	58.4879	25.7268	0.14054	7.8353E-09	0.0193776	7.47993	2.4228	5.59498	0.00015512	1.8059E-08	0.0144993	1.6197E-08	0.00932219	6.7328E-09	99.8963043
TA12-002	30	plag	64.5855	19.4755	0.0377503	7.8209E-09	0.0143287	0.350194	12.9876	2.45395	0.0328691	0.00859313	1.5569E-08	1.6139E-08	0.00865662	0.00145447	99.9563964
TA12-002	31	plag	59.1734	26.185	0.0901497	7.839E-09	0.0128309	7.63371	1.24866	6.30453	0.0166218	0.00658203	0.0303342	1.6213E-08	0.0116839	0.0199502	100.733453
TA12-002	32	plag	64.64	19.6409	0.0533393	7.8193E-09	6.1455E-09	0.364066	13.2279	2.31277	0.0327093	0.00884389	0.0197175	1.6135E-08	0.00345368	0.28894	100.59264
TA12-002	33	plag	58.89	26.0687	0.104946	0.00962085	6.2927E-09	7.74983	1.39753	6.19278	0.0013957	1.8064E-08	1.5619E-08	0.020194	7.2022E-09	6.7152E-09	100.434997
TA12-002	34	plag	64.2142	19.3473	0.00033544	7.8201E-09	6.1374E-09	0.307383	13.3919	2.18557	0.00662048	1.8038E-08	1.5566E-08	1.6134E-08	0.0103779	0.0451589	99.5088458
TA12-002	35	plag	58.7125	26.2751	0.0876412	0.00751027	0.0187231	7.73205	1.01772	6.38935	0.0155378	1.8066E-08	1.5623E-08	1.6214E-08	0.0157726	6.7052E-09	100.271905
TA12-002	36	plag	64.7642	19.689	0.07028	7.8189E-09	0.0101139	0.356204	13.5562	1.96002	0.0350455	1.8034E-08	0.00920101	1.6132E-08	0.0121048	6.8055E-09	100.462369
TA12-003	37	plag	58.7714	26.1107	0.0827486	7.8391E-09	6.3025E-09	7.66853	1.00144	6.45591	1.4639E-08	1.8064E-08	1.5618E-08	0.0740636	7.2107E-09	6.6996E-09	100.164792
TA12-003	38	plag	64.6377	19.2826	0.0563586	7.8192E-09	0.0120677	0.303914	13.3792	2.20737	0.0406247	1.8034E-08	0.0289193	1.6134E-08	7.1129E-09	6.8002E-09	99.9487544
TA12-003	39	plag	58.6181	25.7989	0.120233	0.00187794	0.0120192	7.69698	1.09014	6.31389	0.0120254	1.8061E-08	0.0171392	0.0690023	0.00174941	0.146554	99.8986105
TA12-003	40	plag	64.5449	19.3472	0.0682693	7.8192E-09	6.1401E-09	0.327864	13.4525	2.13972	0.0381971	1.8034E-08	1.5564E-08	0.0100511	7.111E-09	6.8029E-09	99.9287016
TA12-003	41	plag	58.3084	25.8026	0.12934	7.8391E-09	6.2929E-09	7.68866	1.30556	6.1399	0.0126998	1.8064E-08	1.5621E-08	1.621E-08	7.2032E-09	0.0456374	99.4327973
TA12-003	42	plag	64.5204	19.3536	0.0927424	0.00538524	6.1337E-09	0.340383	13.8453	1.86571	0.022952	1.8032E-08	0.00131372	1.6127E-08	0.00691123	0.0116795	100.066377
TA12-003	43	plag	58.8275	25.64	0.124612	0.00352115	0.00577925	7.64125	1.70472	5.89794	0.0168321	1.8063E-08	0.0105488	1.6206E-08	0.00232951	0.102858	99.9778908
TA12-003	44	plag	64.6189	19.3565	0.0155973	7.8185E-09	6.1352E-09	0.33916	13.7359	1.96528	0.0200584	1.8035E-08	0.0368006	1.613E-08	0.00344998	0.0393934	100.13104
TA12-003	45	plag	58.9638	25.8471	0.126316	7.8395E-09	0.00337451	7.69855	1.24194	6.34167	1.4641E-08	1.8064E-08	1.5622E-08	1.6212E-08	0.00525606	0.170822	100.398829
TA12-003	46	plag	64.722	19.32	0.069269	7.8187E-09	0.0050901	0.316641	13.4683	2.06167	0.0290993	0.00151631	0.0144571	0.0335028	0.00172618	6.8028E-09	100.043272
TA12-003	47	plag	59.0594	25.875	0.0250679	7.8414E-09	0.00257731	7.58313	1.15332	6.45192	0.00506628	1.8071E-08	1.5625E-08	1.6217E-08	7.2111E-09	6.7075E-09	100.155482
TA12-003	48	plag	64.5647	19.3076	0.0514985	7.8197E-09	6.1392E-09	0.361539	13.4519	2.14504	0.0254843	1.8036E-08	1.5565E-08	1.6133E-08	0.0040274	6.8047E-09	99.9117893
TA12-003	49	plag	58.9576	25.8618	0.0995865	0.00727573	0.00962055	7.65291	1.12736	6.36262	1.4641E-08	1.8066E-08	0.00131902	1.6215E-08	7.2094E-09	6.7076E-09	100.080092
TA12-003	50	plag	64.8921	19.5931	0.0521696	0.00374704	0.0103729	0.304906	13.406	2.10097	0.0313219	0.00278016	1.5565E-08	0.0201044	7.1139E-09	6.8013E-09	100.417572
TA12-004	51	sill	36.4979	59.9792	1.12828	7.8004E-09	0.014833	0.0028017	0.00252724	0.00447296	0.00494618	0.0449172	1.5623E-08	1.6212E-08	7.3019E-09	6.2458E-09	97.6798783
TA12-004	52	plag	65.4186	19.4422	0.0516557	7.8183E-09	6.1232E-09	0.252751	14.307	1.59433	1.4653E-08	1.8035E-08	1.5561E-08	1.6126E-08	0.00978781	6.8214E-09	101.076325
TA12-004	53	plag	65.5174	19.3008	0.0392392	0.00093652	6.1336E-09	0.230252	14.1468	1.8179	0.0129761	1.8033E-08	0.0289081	0.033493	7.1041E-09	0.0365056	101.165211

TA12-004	54	qtz	99.0916	0.0650516	0.0246365	7.9122E-09	6.0967E-09	0.0102666	2.6943E-09	0.00674979	0.00300818	0.0158144	1.5823E-08	1.6421E-08	0.00181535	0.134958	99.3539005
TA12-004	55	sill	36.5988	61.0909	1.09871	7.7997E-09	0.00634287	0.00929397	2.6413E-09	0.00546549	0.00923863	0.102886	1.5621E-08	1.6211E-08	7.3006E-09	0.0108379	98.9324749
TA12-004	56	sill	36.6879	60.7747	1.21775	0.016598	0.0302546	2.6157E-09	2.6409E-09	0.00318406	0.00570883	0.0772555	1.562E-08	0.00504642	7.2997E-09	6.2428E-09	98.8183974
TA12-005	57	zn-spl	0.00109831	52.9816	29.0126	0.0651478	6.83753	2.407E-09	2.4412E-09	2.2115E-09	0.0859069	0.632911	0.710681	8.05033	6.7713E-09	0.0221683	98.3999733
TA12-005	58	zn-spl	6.9592E-09	52.8091	28.985	0.064275	6.77307	2.407E-09	2.4412E-09	2.2115E-09	0.0741578	0.604067	0.679715	7.99772	6.7712E-09	4.4568E-09	97.9871048
TA12-005	59	zn-spl	6.9602E-09	53.207	29.106	0.0579389	6.84557	2.4072E-09	2.4414E-09	2.21E-09	0.0795485	0.626754	0.649901	8.09986	6.7719E-09	4.4602E-09	98.6725724
TA12-005	60	sill	36.5037	60.7105	1.1254	7.8003E-09	0.0177149	0.00322061	0.00114873	1.5191E-09	1.4443E-08	0.0313671	1.5622E-08	1.6212E-08	7.3017E-09	6.2428E-09	98.3930514
TA12-005	61	qtz	97.9596	0.0715317	0.058935	7.9098E-09	0.0194689	2.6643E-09	2.6937E-09	0.00852362	0.0534563	0.0145346	0.0627702	1.6418E-08	7.4773E-09	0.0800817	98.3289021
TA12-005	62	qtz	98.1733	0.0784621	0.14778	7.9104E-09	0.014169	0.0164746	2.6935E-09	0.0172642	0.00938372	0.00994253	0.00133558	0.00681502	7.4768E-09	0.189528	98.6644548
TA12-005	63	qtz	98.1736	0.088834	0.127386	7.9098E-09	0.0205196	0.00399931	0.0007028	1.593E-09	0.0207905	1.8193E-08	0.00534113	0.0477039	0.0114935	0.0415107	98.5418815
TA12-005	64	qtz	98.6766	0.0678549	0.060821	7.9114E-09	6.0979E-09	0.0139465	0.00210872	1.5917E-09	0.0212628	1.8199E-08	0.0160286	1.642E-08	0.00181524	6.8898E-09	98.8604378
TA31-001	1	crn	7.4311E-09	97.9617	1.05995	7.7524E-09	5.7246E-09	0.00750528	2.6181E-09	1.4711E-09	0.0307319	0.130282	1.5531E-08	1.6121E-08	7.2206E-09	5.9601E-09	99.1901692
TA31-001	2	TiMa	6.0794E-09	4.84166	68.1535	0.0877315	1.78453	2.1967E-09	2.242E-09	2.7919E-09	20.3075	0.464851	0.06527	1.4515E-08	0.0130733	0.0412805	95.7593963
TA31-001	3	rt	5.3723E-09	0.197616	0.208766	7.5112E-09	7.6772E-09	0.00524475	2.1312E-09	0.00875464	97.3906	0.0626943	0.0504945	1.4952E-08	0.00334843	1.0264E-08	97.9275187
TA31-001	4	TiMa	5.8635E-09	1.31075	50.7611	0.119689	3.12044	2.1659E-09	2.2187E-09	2.62E-09	43.8208	0.133655	0.0340179	0.0228425	0.00592995	0.00509308	99.3343174
TA31-001	5	gt	39.3139	21.6671	24.925	0.621935	10.8483	1.8914	2.5139E-09	0.00840034	0.0307789	0.0200425	1.5231E-08	0.0229038	0.0011268	5.297E-09	99.3508874
TA31-001	6	gt	39.3203	21.4824	24.8575	0.621699	10.8993	1.91163	2.5138E-09	0.018689	0.0258361	0.0382474	0.034878	0.0130882	6.9629E-09	0.0804758	99.3040435
TA31-001	7	gt	38.9518	21.425	24.9009	0.607526	10.7148	1.88975	2.513E-09	0.023354	0.0174434	0.0186489	0.0258324	1.5669E-08	6.9611E-09	5.2888E-09	98.5750547
TA31-001	8	spl	4.62924	55.0855	30.1279	0.30541	8.49751	0.342618	2.472E-09	2.0546E-09	0.00229059	0.0913369	0.00635095	0.0242512	0.0011061	0.0105759	99.1240896
TA31-001	9	?	58.0942	16.3981	12.6087	0.447381	1.95652	6.49884	2.5631E-09	0.104066	0.0362349	0.0130836	1.5466E-08	1.5971E-08	0.00287441	0.0697949	96.2297948
TA31-001	10	opx	45.5043	10.4688	26.3565	0.72909	15.3935	0.420735	2.5217E-09	0.00405923	0.0121462	0.00450866	1.5242E-08	0.0196397	6.9867E-09	0.065482	98.9787608
TA31-001	11	?	51.998	14.0328	21.0457	0.705522	10.2633	2.73329	2.5409E-09	0.052184	0.0307703	0.00953643	0.0415528	0.079025	7.0408E-09	0.0391729	101.030853
TA31-001	12	sill	36.3753	60.4016	1.10373	7.7989E-09	0.0267274	0.00212061	0.00045944	1.5202E-09	0.00749462	0.0692517	1.5616E-08	0.0538771	7.3009E-09	6.2441E-09	98.0405609
TA31-001	13	?	58.0997	15.0641	12.9492	0.402034	2.23461	4.52693	1.56143	0.20023	1.74003	0.00169005	0.041749	0.0497011	0.0252845	6.2519E-09	96.8966887
TA31-001	14	?	51.0994	15.582	13.5686	0.479742	2.58814	4.37268	1.44531	0.181443	1.46117	0.00047952	0.0117222	1.5891E-08	0.00916065	0.0994164	90.8992638
TA31-001	15	spl	3.80862	50.8523	32.4226	0.359848	8.48233	0.119088	2.4533E-09	0.0145207	0.858751	0.0705032	0.0241943	0.0756563	6.7843E-09	4.6447E-09	97.0884115
TA31-001	16	spl	0.0740681	54.8708	32.12	0.221571	10.1511	0.00642465	2.4542E-09	2.1056E-09	1.07286	0.134908	0.210041	0.185154	6.7844E-09	4.631E-09	99.0469268
TA31-001	17	?	59.2585	15.3561	13.1369	0.462269	2.20264	4.54964	1.57585	0.189874	1.77489	0.00531273	1.544E-08	0.00165424	0.0155192	6.2604E-09	98.5291492
TA31-001	18	sill	36.4475	60.969	1.03202	7.8006E-09	0.0268177	0.00528942	2.6418E-09	0.0109228	0.0122019	0.0491969	0.0158396	1.6213E-08	0.00413554	0.0352072	98.6081311
TA31-001	19	sill	36.4052	60.5856	1.15581	7.7995E-09	0.0254663	0.0133424	2.6414E-09	0.00844864	1.4442E-08	0.0265951	0.0105591	1.6211E-08	7.301E-09	6.2405E-09	98.2310216
TA31-001	20	?	37.5218	25.3642	0.58177	0.00422539	0.0242078	0.025411	2.6593E-09	1.5493E-09	0.0119038	0.0201775	1.5691E-08	1.6282E-08	7.3617E-09	0.124215	63.6779105
TA31-001	21	?	60.9341	16.4771	9.09004	0.315438	1.99676	2.72684	2.72038	0.221949	1.58185	0.02305	0.00130894	0.00666327	7.1411E-09	6.3963E-09	96.0954792
TA31-002	22	zn-spl	0.00013714	55.1224	29.3452	0.0682468	9.51939	2.4239E-09	2.4556E-09	2.1265E-09	0.0814178	0.745878	0.427033	3.88432	0.00165036	0.0813839	99.277057
TA31-002	23	zn-spl	0.0182331	55.3209	28.9015	0.0437578	9.41777	2.426E-09	2.4577E-09	2.1178E-09	0.0818659	0.734572	0.422227	3.78209	6.8045E-09	4.6E-09	98.7229158
TA31-002	24	opx	44.764	13.3944	24.9129	0.599732	16.2704	0.334577	2.5297E-09	0.00847305	0.00076826	0.00476393	0.0336537	0.0770831	0.0114137	5.2487E-09	100.412165
TA31-002	25	opx	47.6542	9.31045	24.9983	0.645874	17.901	0.385268	2.5325E-09	1.9847E-09	0.0333876	0.0122752	0.0155466	1.5731E-08	7.0148E-09	0.0474749	101.003776
TA31-002	26	?	55.8566	18.2127	14.5841	0.509188	1.23412	7.50715	0.0845081	0.243674	0.0935817	0.00624402	0.0430237	1.5911E-08	7.0565E-09	6.1727E-09	98.3748895
TA31-002	27	?	54.3318	19.4847	15.5762	0.5066	1.69117	6.7238	0.0558105	0.230683	0.0981366	1.7054E-08	1.5407E-08	1.5892E-08	7.053E-09	6.0843E-09	98.6989002
TA31-002	28	?	25.5359	35.4041	28.0891	0.501625	13.06	0.260517	2.4992E-09	0.00288703	0.0379627	0.0497542	0.032164	0.118933	0.00847577	4.9703E-09	103.101419
TA31-002	29	spl	3.49282	57.3543	28.9067	0.328434	10.3331	0.052914	2.4796E-09	0.00118572	0.0431833	0.107096	0.0140804	0.0194406	6.856E-09	4.7608E-09	100.653254
TA31-002	30	spl	1.1103	57.9692	29.0631	0.306693	9.97911	0.0373479	2.4752E-09	0.0114564	0.0537999	0.142984	0.0204493	0.0825017	0.0016607	4.7195E-09	98.7786029
TA31-002	31	gt	39.141	21.2253	25.3073	0.61963	10.527	1.99183	2.5108E-09	2.0097E-09	0.0161236	0.0177093	1.5218E-08	0.107888	0.0136127	0.0709416	99.0383352
TA31-002	32	gt	39.3351	21.6118	25.4725	0.619288	10.7379	1.97527	2.5113E-09	0.0103214	0.011561	0.0138275	1.5221E-08	0.0653978	0.00567327	5.28E-09	99.858639
TA31-002	33	?	10.6766	2.96257	25.9662	0.730092	3.46825	1.21573	2.2648E-09	0.0334167	43.0109	0.0101484	1.4633E-08	0.0639276	6.2344E-09	7.1612E-09	88.1378347
TA31-002	34	crd??	33.3514	26.6785	23.0272	0.529578	15.3678	0.340639	2.5205E-09	0.00439433	1.46231	0.0623465	1.5244E-08	0.0262249	0.00511863	0.0687465	100.924258
TA31-002	35	gt	39.0591	21.4026	25.3134	0.623015	10.5896	1.93414	2.5114E-09	0.0171204	0.00791457	0.00407941	1.5224E-08	1.5662E-08	6.9569E-09	0.0046483	98.9556177

TA31-002	36	TiMa	6.0144E-09	1.50409	68.7721	0.0570458	1.78792	2.1843E-09	2.2309E-09	0.00560947	25.9025	0.306934	0.016887	0.0798936	6.1493E-09	0.12839	98.5613699
TA31-002	37	opx	40.8589	15.1356	24.2676	0.499939	15.7286	0.269195	2.5219E-09	1.9913E-09	1.16807	0.0707997	1.5248E-08	1.5693E-08	0.00395444	5.2816E-09	98.0026582
TA31-002	38	opx	42.091	14.0273	24.6479	0.533623	16.0363	0.280228	2.5233E-09	1.9946E-09	0.82723	0.0529814	0.0168147	0.0180228	0.00797117	5.2633E-09	98.5393711
TA31-002	39	rt	5.3703E-09	0.139914	0.121994	7.5121E-09	0.00372398	0.0123647	2.1306E-09	2.1998E-09	97.8578	0.0681178	0.0209371	1.4952E-08	5.911E-09	1.0277E-08	98.2248516
TA31-002	40	?	59.3651	15.3856	11.3408	0.401549	1.98829	4.29204	3.08724	0.202547	1.39873	0.00024311	1.5458E-08	1.5965E-08	7.0822E-09	0.0122765	97.4744156
TA31-002	41	spl	0.0369753	57.4967	23.9172	0.0736964	15.2849	2.466E-09	2.4943E-09	1.9403E-09	0.680163	0.169278	0.246545	0.135081	0.00618419	0.101489	98.1482119
TA31-002	42	opx	46.3033	10.6683	24.2426	0.6339	17.6994	0.325283	2.5327E-09	0.00570865	0.382682	0.00045567	1.5283E-08	0.0607408	7.0143E-09	5.3036E-09	100.32237
TA31-003	43	rt	5.3708E-09	0.163902	0.11212	7.5119E-09	0.00364652	0.00956971	0.00111196	2.1996E-09	97.9398	0.105247	1.4587E-08	0.0310356	0.00860913	1.0276E-08	98.375042
TA31-003	44	rt	5.3705E-09	0.159832	0.0774028	0.0123737	7.6744E-09	0.00785467	0.00055593	2.1997E-09	97.2988	0.112876	0.0270954	0.0015518	5.9112E-09	0.0287794	97.7271217
TA31-003	45	TiMa	5.7849E-09	0.4761	38.4922	0.47561	6.16328	2.1542E-09	2.2127E-09	0.0105368	52.8761	0.125811	0.068458	0.0491033	6.0903E-09	0.093639	98.8308381
TA31-003	46	plag	59.5188	16.7715	6.66582	0.128234	1.71087	3.99563	5.92005	0.0979038	2.05785	1.7649E-08	1.5498E-08	1.6027E-08	7.0814E-09	0.196903	97.0635609
TA31-003	47	bio?	35.2197	17.3166	12.634	7.614E-09	13.5828	0.0203738	9.74227	0.103516	5.89268	0.10454	0.112525	0.0574159	6.8376E-09	0.36989	95.1563107
TA31-003	48	opx	49.3186	6.29855	17.9229	0.355664	23.4931	0.388249	2.5631E-09	1.8604E-09	1.02055	0.0284039	0.103012	0.0182092	0.00749284	5.5538E-09	98.9547309
TA31-003	49	spl	0.1244	50.8289	30.8543	0.239187	12.1422	0.00318953	2.4465E-09	0.00298559	2.91696	0.382781	0.395762	0.13198	0.00996215	4.7513E-09	98.0326073
TA31-003	50	bio?	35.5236	17.2763	12.0489	0.00319546	13.1919	2.5621E-09	9.74866	0.0820175	6.62083	0.102346	0.100916	1.5743E-08	0.00557932	0.383041	95.0872853
TA31-003	51	TiMa	0.185035	9.18712	54.9786	0.447632	5.08261	0.0134237	2.2591E-09	2.6626E-09	23.7074	0.293902	0.224726	1.4648E-08	0.00856235	4.9941E-09	94.1290111
TA31-003	52	bio?	35.6148	16.951	13.6338	0.0258166	12.4723	0.00703858	9.60403	0.0801325	5.77517	0.0890262	0.164113	1.5717E-08	0.00947987	0.256671	94.6833778
TA31-003	53	spl	0.10731	42.1242	39.6206	0.157019	11.9565	2.3712E-09	2.407E-09	0.0108486	2.56818	0.14208	0.331783	0.289797	6.6541E-09	4.3806E-09	97.3083176
TA31-003	54	opx	45.0846	12.1735	19.3869	0.478946	20.7756	0.336658	2.5539E-09	1.8865E-09	0.450146	0.0206807	0.0520518	0.0247692	7.0678E-09	0.0392362	98.8230879
TA31-003	55	plag	59.4984	16.1874	8.94329	0.260034	1.55411	4.55842	5.50376	0.101728	1.50775	0.00122723	0.013071	1.5984E-08	0.00687673	0.249385	98.385452
TA31-003	56	bio?	35.3997	17.3756	14.2579	0.0187205	12.7277	0.00680264	9.7307	0.0720576	5.69688	0.0939262	0.139491	0.0262017	0.00165659	0.482911	96.0302472
TA31-003	57	bio?	35.4907	17.159	11.4434	7.6289E-09	14.2812	0.0176759	9.90171	0.0830305	6.42885	0.0843704	0.145006	1.5759E-08	0.00893561	0.405877	95.4497554
TA31-003	58	spl	0.104381	52.3154	29.2518	0.0418943	14.7933	2.4313E-09	2.4622E-09	2.0645E-09	1.60579	0.359007	0.376241	0.431248	6.8032E-09	0.0473555	99.3264168
TA31-003	59	bio?	35.0264	17.0349	15.1415	7.5806E-09	11.7015	2.55E-09	9.70267	0.112735	5.72925	0.0857094	0.175416	0.0752071	0.00834338	0.181556	94.9751869
TA31-003	60	bio?	35.1884	17.0786	14.032	7.5957E-09	12.5931	2.5553E-09	9.61957	0.129861	5.77181	0.101646	0.158858	0.0442147	0.00780213	0.147534	94.8733958
TA31-003	61	opx	46.647	9.64293	18.2681	0.334741	22.2852	0.382429	2.5565E-09	1.8687E-09	1.47997	0.0319122	0.0507983	0.0264526	7.073E-09	5.5437E-09	99.1495331
TA31-003	62	?	61.672	17.1749	7.22256	0.213215	1.444	4.48816	5.52594	0.137202	1.43796	0.00024704	1.5502E-08	1.6031E-08	0.0120773	0.172065	99.5003264
TA31-003	63	opx	47.2628	8.55672	18.2732	0.364931	22.6319	0.415981	2.556E-09	0.0128862	1.60919	0.0238795	0.106798	0.0363697	7.0715E-09	0.071205	99.3658604
TA31-003	64	spl	0.199883	53.3548	31.8263	0.234883	10.8711	0.010812	2.4488E-09	0.0211971	2.36199	0.219674	0.4034	0.104607	0.00109512	4.7087E-09	99.6097412
TA31-003	65	?	47.6844	8.15276	18.276	0.437141	17.5754	1.04852	0.496696	0.0151176	1.2198	0.0186456	0.0832515	0.0643637	0.006309	0.109584	95.1879884
TA31-003	66	sill	36.5872	60.7635	1.17065	7.7978E-09	0.013327	2.6158E-09	2.6411E-09	0.0125355	1.4439E-08	0.0677284	0.0118747	0.0505057	7.3002E-09	6.2403E-09	98.6773213
TA31-003	67	sill	36.4221	60.0558	1.03259	7.8003E-09	0.0305984	0.00138788	2.6419E-09	0.00725586	0.0186351	0.0193263	0.00527413	0.0538843	0.0059171	0.0920255	97.7447946
TA31-003	68	sill	36.4632	60.7154	1.05376	7.8E-09	0.0156296	0.0145494	2.6416E-09	1.5189E-09	1.4444E-08	0.0695208	0.0250788	1.6212E-08	7.3016E-09	6.2472E-09	98.3571387
TA31-003	69	sill	36.3125	60.0562	1.10712	7.799E-09	0.0386986	2.6161E-09	2.6414E-09	1.5205E-09	0.00616904	0.081547	0.0316768	1.6211E-08	0.00413505	6.2457E-09	97.6380465
TA31-004	70	crn	7.4297E-09	98.0062	1.20434	7.7503E-09	0.00617197	0.00469952	2.6176E-09	0.00038447	0.015437	0.110534	1.5527E-08	0.0284354	0.00759326	5.9516E-09	99.3837957
TA31-004	71	crn	0.0367299	98.6136	1.16461	7.751E-09	0.00147712	2.5948E-09	2.6179E-09	1.473E-09	0.016097	0.101342	0.0183549	1.6119E-08	0.0163547	0.0999602	100.068526
TA31-004	72	sill	36.3721	59.8218	0.962293	0.00373867	0.013061	0.00502861	2.6423E-09	1.5174E-09	0.0072942	0.0660357	0.00263816	1.6215E-08	0.00354561	6.2546E-09	97.257535
TA31-004	73	sill	36.3156	60.9438	1.01904	7.8001E-09	0.0167382	0.003718	0.00482439	0.0107337	0.0114347	0.0805683	0.0197983	1.6212E-08	7.301E-09	0.159591	98.5858466
TA31-004	74	sill	36.3396	60.091	1.0067	0.00070087	0.0173636	0.00343034	2.6419E-09	0.00227836	0.0159798	0.0642598	1.562E-08	0.0353624	7.3023E-09	0.0853195	97.6619947
TA31-004	75	?	35.0666	53.5583	3.18369	7.7683E-09	0.421287	0.259889	0.0494082	0.0289661	0.713933	0.0559775	0.0315493	1.6149E-08	0.0423467	0.0751946	93.4871414
TA31-004	76	crd??	36.5183	32.6903	21.769	0.354963	5.61738	0.696889	2.5257E-09	0.00710273	2.10487	0.029585	0.0103467	1.5716E-08	0.00512606	5.482E-09	99.8038625
TA31-004	77	?	45.9705	24.4536	2.26841	0.0684787	0.521095	12.5445	0.0463218	0.30448	1.93988	0.00351643	1.5533E-08	0.0618222	0.00057073	0.0756557	88.2588306
TA31-004	78	TiMa	5.9264E-09	1.8914	57.3203	7.0541E-09	1.373	2.1739E-09	2.2237E-09	0.0127968	35.438	0.194212	0.073811	0.0878026	6.1239E-09	5.4513E-09	96.3913224
TA31-004	79	TiMa	5.9572E-09	2.75365	58.3844	7.0395E-09	1.50308	2.1795E-09	2.2283E-09	2.7083E-09	32.3101	0.220452	0.0895681	0.0817542	0.00099319	5.2802E-09	95.3439975
TA31-004	80	TiMa	5.9222E-09	1.24718	56.9864	7.0509E-09	1.49321	2.1726E-09	2.2224E-09	0.00931549	35.0328	0.183826	0.083468	0.0529571	6.1204E-09	5.4402E-09	95.0891566
TA31-004	81	?	33.9075	0.0101427	0.603246	7.8895E-09	0.0157993	0.00709304	2.6842E-09	1.6178E-09	0.136975	1.8088E-08	1.5767E-08	1.6379E-08	7.4497E-09	0.0572173	34.7379734

TA31-004	82	?	33.8716	0.0132602	0.573369	7.8877E-09	0.0252705	2.6556E-09	2.6852E-09	1.6181E-09	0.065941	1.8088E-08	0.046581	1.6381E-08	7.4527E-09	0.0834342	34.679456
TA31-004	83	sill	36.5738	60.8578	1.04937	7.8E-09	0.0128685	2.6165E-09	2.6417E-09	0.00556537	0.011282	0.049944	1.5618E-08	0.0437792	0.00473324	0.086616	98.6957583
TA31-004	84	sill	36.5907	60.995	1.08532	7.8E-09	0.0317319	2.6162E-09	2.6415E-09	0.0089498	1.4442E-08	0.0946067	1.5622E-08	1.6211E-08	0.00473237	0.167677	98.9787178
TA31-004	85	sill	36.1424	60.3318	1.06292	7.8005E-09	0.00761947	0.00052369	0.00183799	1.5184E-09	0.00397751	0.0594816	1.5622E-08	1.6212E-08	7.3018E-09	6.2463E-09	97.6105603
TA31-004	86	sill	36.4967	61.0859	1.1052	7.7988E-09	0.0307358	0.00018327	2.6414E-09	1.5197E-09	0.0114848	0.0471724	0.0356334	0.0117861	7.3009E-09	6.2417E-09	98.8247958
TA31-004	87	spl	0.0393743	51.4491	33.1714	0.00869674	8.69889	2.4049E-09	2.4386E-09	2.1964E-09	0.34181	0.531855	0.406256	3.2152	6.7507E-09	4.4555E-09	97.8625821
TA31-004	88	TiMa	0.027127	1.39259	50.7932	0.119156	1.58299	2.1645E-09	2.217E-09	2.6388E-09	41.7313	0.154386	0.0206161	0.0030367	0.00493818	5.938E-09	95.82934
TA31-004	89	sill	36.3601	59.7681	1.20228	7.7973E-09	0.0323915	2.6156E-09	2.6409E-09	1.5229E-09	0.0172989	0.0769987	0.0329892	0.023569	7.2998E-09	6.2419E-09	97.5137273
TA31-004	90	sill	36.5086	61.7596	1.27881	7.7968E-09	0.0299257	0.00889804	2.6403E-09	0.00727343	1.4435E-08	0.0591756	0.0184738	1.6206E-08	0.0011809	0.215822	99.8877595
TA31-004	91	sill	36.4268	60.9195	1.36723	7.7969E-09	0.0286018	0.00410871	2.6403E-09	1.5232E-09	0.0127548	0.0290805	1.5618E-08	1.6206E-08	0.00236191	6.2311E-09	98.7904378
TA31-004	92	spl	0.0885594	49.9454	38.5986	0.122374	9.22708	2.3934E-09	2.4277E-09	2.2258E-09	0.509369	0.114968	0.0468297	0.270097	0.0038026	0.118587	99.0456667
TA31-004	93	opx	45.3394	11.4185	24.0912	0.631345	16.9482	0.233243	2.5328E-09	1.9795E-09	0.15954	0.0173111	0.0479323	0.0541638	7.015E-09	5.2813E-09	98.9408352
TA31-004	94	gt	37.8912	21.781	25.6548	0.586963	13.1115	0.27479	2.5178E-09	0.00651174	0.229808	0.0366823	1.5222E-08	0.0130864	0.00169241	5.1782E-09	99.5880339
TA31-004	95	?	44.1731	14.7441	14.4153	0.0286219	2.40562	2.07635	1.18149	0.0281948	0.799799	1.6871E-08	1.538E-08	1.5859E-08	0.0108998	5.879E-09	79.8634756
TA31-004	96	sill	36.3867	59.942	1.11172	0.00373743	0.0340539	0.0141285	2.6414E-09	1.5205E-09	0.0181206	0.0700077	0.0158386	1.6211E-08	0.0118322	0.0243807	97.6325197
TA31-004	97	sill	36.3489	60.6754	1.13737	7.7985E-09	0.0259547	0.00683264	2.6412E-09	1.5206E-09	0.0088707	0.0602115	0.0343144	1.621E-08	0.00413457	0.0635839	98.3655724
TA31-004	98	gt	39.3803	21.6458	25.2428	0.581091	10.9639	1.9428	2.5129E-09	2.0016E-09	0.0206915	0.011345	0.0154998	1.5669E-08	6.9607E-09	5.2859E-09	99.8042273
TA31-005	99	crn	7.4294E-09	97.0543	1.2493	7.7501E-09	0.0131864	0.00475118	2.6174E-09	1.4742E-09	0.00571881	0.107776	1.5528E-08	0.00836324	7.2188E-09	0.00256373	98.4459594
TA31-005	100	TiMa	5.9262E-09	1.35322	57.5854	7.0467E-09	1.37425	2.1734E-09	2.223E-09	0.0035216	34.3474	0.250849	1.4316E-08	1.4563E-08	0.0144034	0.100442	95.029486
TA31-005	101	?	34.163	0.0337883	0.0690958	0.00710332	0.0188354	0.0078094	2.6927E-09	1.596E-09	0.00331724	0.00688099	0.0267031	1.6414E-08	7.4742E-09	0.147644	34.4841776
TA31-005	102	rt	0.110957	1.4339	0.405483	0.00022501	7.661E-09	0.0273843	2.1373E-09	2.1939E-09	96.1611	0.0626913	0.0209556	1.4963E-08	0.000959	1.0209E-08	98.2236552
TA31-005	103	sill	36.3589	60.0981	1.11485	0.0032706	0.0263851	2.6165E-09	2.6417E-09	1.5195E-09	0.00387538	0.0404014	1.5622E-08	1.6212E-08	7.3019E-09	0.0176027	97.6633852
TA31-005	104	sill	36.725	61.154	1.10908	7.7988E-09	0.0080447	0.00926769	2.6413E-09	1.5201E-09	0.0169461	0.0582125	1.5616E-08	0.0589274	7.3008E-09	6.2439E-09	99.1394784
TA31-005	105	sill	36.5933	60.4804	1.14517	7.8001E-09	0.0285693	2.6164E-09	2.6416E-09	0.00566711	1.4443E-08	0.0376375	1.5622E-08	1.6212E-08	7.3016E-09	0.0581874	98.3489314
TA31-005	106	gt	39.3815	21.641	24.9871	0.596186	10.9817	1.90746	2.514E-09	0.0100272	0.0220564	0.0124885	1.5232E-08	0.0130887	6.9635E-09	5.2939E-09	99.5526068
TA31-005	107	sill	36.5524	60.699	1.14815	7.7988E-09	0.0264565	2.6161E-09	2.6413E-09	0.00626444	0.00887105	0.0511811	0.031676	1.621E-08	0.00413492	6.2418E-09	98.528134
TA31-005	108	sill	36.5705	61.1131	1.15618	7.7996E-09	0.0259972	0.00594293	2.6413E-09	1.5196E-09	0.0140879	0.0416499	1.5621E-08	1.6211E-08	7.3007E-09	6.2418E-09	98.927458
TA31-005	109	sill	36.3766	60.3215	1.09941	7.7995E-09	0.0205542	0.00712176	2.6416E-09	1.5199E-09	0.0101585	0.0318684	0.0343173	1.6211E-08	0.00236304	0.0500742	97.9539674
TA31-006	110	sill	36.6893	61.1917	1.09011	7.7999E-09	0.0141211	2.6155E-09	2.6408E-09	0.0127261	0.178845	0.0509447	1.562E-08	1.621E-08	7.2989E-09	0.0514989	99.2792459
TA31-006	111	sill	36.4422	60.9156	1.05395	7.8E-09	0.0302521	0.00070691	2.6415E-09	1.5188E-09	0.0340993	0.071779	1.562E-08	0.0202057	7.301E-09	0.0392762	98.6080692
TA31-006	112	?	57.2895	17.4971	13.4865	0.492453	1.5435	6.95987	2.5555E-09	0.072546	0.0948378	0.0210261	1.5447E-08	1.5945E-08	7.0843E-09	6.2152E-09	97.4573329
TA31-006	113	opx	41.2744	16.1273	25.1369	0.64806	16.2932	0.304135	2.5244E-09	0.00785057	0.0595941	0.0133422	1.525E-08	0.00162879	0.0102547	0.0666417	99.9433071
TA31-006	114	opx	47.3184	7.85202	26.499	0.810557	17.057	0.365426	2.5238E-09	0.00545209	0.00602931	0.00473898	0.0181061	1.569E-08	6.9925E-09	0.125255	100.061985
TA31-006	115	opx	42.2976	16.3866	24.8657	0.693826	15.0465	0.468411	2.5257E-09	1.9891E-09	0.047239	0.0122372	1.5255E-08	1.5701E-08	0.0136788	5.2468E-09	99.831792
TA31-006	116	?	41.6292	16.0114	12.4823	0.0314223	1.68874	2.39924	1.13793	0.0451714	1.29822	0.00071432	0.028627	0.0726723	0.0177822	5.9933E-09	76.8434195
TA31-006	117	opx	43.0939	14.4463	23.7114	0.679906	16.0189	0.25975	2.5316E-09	1.9736E-09	0.150863	0.0256333	1.5278E-08	0.00163211	0.0011345	0.00928985	98.3987088
TA31-006	118	spl	5.16275	52.6103	29.0283	0.335885	11.3896	0.0270684	2.4767E-09	2.0383E-09	0.24353	0.0685987	0.0191939	0.0356293	6.8468E-09	4.741E-09	98.9208553
TA31-006	119	?	43.5912	18.5562	11.5258	0.0161036	2.20224	2.41499	1.05136	0.0171645	1.27205	0.00527583	1.5424E-08	1.5924E-08	0.0138213	0.0196488	80.6858541
TA31-006	120	gt	39.6642	21.559	24.7031	0.673383	11.3466	1.9004	2.5154E-09	0.00287605	0.011534	0.0244492	0.0219671	0.0212773	6.9672E-09	0.0443592	99.9731459
TA31-006	121	sill	36.5647	60.3727	1.13211	7.8005E-09	0.0162334	0.00125689	2.6418E-09	1.5195E-09	0.00413059	0.011543	1.5622E-08	1.6212E-08	0.0136084	0.0757637	98.192046
TA31-006	122	gt	39.3842	21.1012	25.115	0.627686	11.0183	1.91429	2.5128E-09	0.0103036	0.0302825	0.0102101	1.5229E-08	1.5669E-08	6.9604E-09	0.140832	99.3523042
TA31-006	123	sill	36.8045	60.9537	1.06379	7.7999E-09	0.0287701	2.6165E-09	2.6417E-09	1.5191E-09	0.011078	0.0491906	1.5618E-08	0.0521987	7.3021E-09	6.246E-09	98.9632274

			SI-K	AL-K	FE-K	MN-K	MG-K	CA-K	K-K	NA-K	TI-K	CR-K	NI-K	ZN-K	CL-K	F-K	
Photo	Line		Compound	Compound	Compound	Compound	Compound	Compound	Compound	Compound	Compound	Compound	Compound	Compound	Compound	Compound_%	
TA12-L6	L6	1	49,1211	10,9799	27,0173	1,06309	11,67	1,68335	2,52E-09	0,045994	0,051146	0,008381	0,051664	0,009809	6,97E-09	5,34E-09	101,7017
TA12-L6	L6	2	0,201454	58,3253	34,4243	0,519674	7,43606	0,002472	2,45E-09	2,12E-09	0,046247	0,08396	0,015264	0,064307	6,78E-09	4,58E-09	101,119
TA12-L6	L6	3	0,387541	59,4656	34,0634	0,583869	7,24812	0,026212	2,46E-09	2,11E-09	0,046636	0,061444	0,006319	0,199473	6,79E-09	0,168145	102,2568
TA12-L6	L6	4	45,9715	7,43892	30,8849	1,29578	13,0606	0,404732	2,5E-09	0,030182	0,040724	1,58E-08	1,52E-08	1,56E-08	0,015815	5,11E-09	99,14315
TA12-L6	L6	5	45,6486	10,1472	30,301	1,23714	11,9652	0,68877	2,5E-09	0,044101	0,080001	0,013338	1,52E-08	0,003235	6,93E-09	0,221159	100,3497
TA12-L6	L6	6	14,2384	41,2791	33,848	0,774411	9,13781	0,102179	2,46E-09	2,15E-09	0,045445	0,03269	0,016581	0,099951	0,003855	4,67E-09	99,57842
TA12-L6	L6	7	26,8677	29,4785	31,8648	0,939105	11,581	0,22683	2,48E-09	2,11E-09	0,06081	0,004369	0,020503	0,072929	6,86E-09	0,19452	101,3111
TA12-L6	L6	8	43,5862	13,7326	27,673	1,06533	13,9533	0,338546	2,51E-09	2,05E-09	0,098343	0,022109	0,027091	0,063684	6,96E-09	5,18E-09	100,5602
TA12-L6	L6	9	47,3054	5,20052	29,4835	1,27183	16,0457	0,367569	2,51E-09	2,08E-09	0,052772	1,59E-08	0,001283	0,047279	0,002249	0,120185	99,89829
TA12-L6	L6	10	53,7621	17,4747	18,5433	0,93838	1,19049	6,42016	0,02433	0,439492	0,198076	1,69E-08	0,015584	1,58E-08	7,01E-09	0,051634	99,05825
TA12-L6	L6	11	46,302	10,575	33,0235	1,46211	8,66714	1,14658	2,49E-09	0,057658	0,128881	1,57E-08	1,51E-08	1,55E-08	0,001116	5,12E-09	101,364
TA12-L6	L6	12	48,6786	13,2997	25,2918	1,04893	5,10627	3,23414	2,51E-09	0,261235	0,154888	1,63E-08	0,055496	0,009801	0,012468	5,5E-09	97,15333
TA12-L6	L6	13	54,7079	16,974	19,7826	0,950642	2,35181	5,65747	0,020802	0,461634	0,184894	0,017729	1,53E-08	1,58E-08	7,02E-09	0,047206	101,1567
TA12-L6	L6	14	0,182586	57,4604	34,5083	0,537609	7,07149	0,001839	2,45E-09	0,00474	0,084843	0,056372	0,043216	0,125305	0,00329	4,56E-09	100,08
TA12-L6	L6	15	48,1591	5,015	29,1389	1,21718	15,7856	0,398007	2,51E-09	0,012501	0,035559	1,59E-08	1,52E-08	1,56E-08	6,96E-09	0,068309	99,83016
TA12-L6	L6	16	38,6405	16,3216	30,1655	1,20554	12,7964	0,449802	2,5E-09	0,000547	0,046237	1,58E-08	0,011571	0,003229	6,91E-09	0,181268	99,82219
TA12-L6	L6	17	47,5804	7,60545	29,8338	1,25195	12,8099	0,840585	2,5E-09	0,03163	0,085354	0,009814	1,52E-08	1,56E-08	6,94E-09	5,19E-09	100,0489
TA12-L6	L6	18	30,8298	23,881	31,8681	0,955106	12,2324	0,261256	2,48E-09	2,12E-09	0,046624	0,045872	1,51E-08	1,55E-08	0,007304	4,89E-09	100,1275
TA12-L6	L6	19	29,517	25,691	31,0878	0,938045	11,7931	0,248829	2,48E-09	2,11E-09	0,067597	0,040793	1,51E-08	0,045416	0,011243	4,9E-09	99,44082
TA12-L6	L6	20	46,2958	11,867	29,5673	1,15698	13,3576	0,564677	2,51E-09	0,050843	0,137888	1,59E-08	0,02191	1,56E-08	6,95E-09	0,199668	103,2197
TA12-L6	L6	21	48,4948	4,6901	29,6124	1,21134	15,999	0,37506	2,51E-09	2,08E-09	0,020333	1,59E-08	0,024488	0,075012	0,009067	0,013609	100,5252
TA12-L6	L6	22	48,1273	6,02029	29,1059	1,2244	15,7694	0,365688	2,51E-09	2,07E-09	0,04076	1,59E-08	0,043847	1,56E-08	6,96E-09	5,18E-09	100,6976
TA12-L6	L6	23	44,3925	11,0747	28,8005	1,09779	14,4647	0,359448	2,51E-09	2,07E-09	0,093075	1,59E-08	1,52E-08	0,02936	6,95E-09	0,054559	100,3666
TA12-L6	L6	24	54,8204	15,7066	19,4984	0,92604	1,65643	5,75656	0,374484	0,454339	0,28937	1,68E-08	1,53E-08	0,06578	0,00397	0,03973	99,5921
TA12-L6	L6	25	54,9515	14,7924	19,4613	0,945985	1,93944	5,8172	0,304778	0,358875	0,306147	1,68E-08	1,53E-08	0,023025	0,001134	5,93E-09	98,90178
TA12-L6	L6	26	41,4111	33,0112	20,3621	0,752086	3,303	3,87718	0,432135	0,389107	0,287692	0,04988	0,018137	0,014783	0,002829	5,68E-09	103,9112
TA12-L6	L6	27	31,5889	31,1319	28,8817	0,681328	3,36296	2,50021	0,057999	0,22842	0,273757	0,025177	1,51E-08	0,00974	6,88E-09	0,106154	98,84824
TA12-L6	L6	28	13,533	50,6443	31,5217	0,629912	5,62648	0,935375	2,47E-09	0,124124	0,202587	0,044789	0,025565	0,084083	0,020683	0,006507	103,3991
TA12-L6	L6	29	39,7152	20,506	28,9774	1,02733	13,1666	0,351633	2,51E-09	0,010102	0,065461	0,010489	1,52E-08	0,044033	0,005665	5,12E-09	103,8799
TA12-L6	L6	30	43,6455	11,744	28,6184	1,25522	13,8755	0,436932	2,51E-09	0,004792	0,062996	0,014058	0,028349	1,56E-08	6,95E-09	0,132021	99,81777
TA12-L6	L6	31	44,7617	10,8553	27,858	1,14281	15,0564	0,370284	2,51E-09	2,05E-09	0,030543	0,012098	1,52E-08	1,56E-08	6,96E-09	5,18E-09	100,0871
TA12-L6	L6	32	1,40614	53,9582	36,8126	0,55224	7,23487	0,009083	2,44E-09	2,18E-09	0,121804	0,049425	0,041872	0,125013	6,75E-09	4,49E-09	100,3112
TA12-L6	L6	33	44,2999	10,8791	28,9787	1,24926	14,1334	0,558342	2,51E-09	2,07E-09	0,022402	0,016061	0,024477	0,052162	0,016419	0,01932	100,2495
TA12-L6	L6	34	0,194467	53,6963	37,8776	0,573827	6,91252	2,4E-09	2,43E-09	0,002438	0,120679	0,055005	0,017731	0,183943	6,73E-09	4,44E-09	99,63451
TA12-L6	L6	35	54,8507	16,6973	17,6431	0,896969	0,909287	6,19997	0,621236	0,458328	0,431477	1,69E-08	1,54E-08	1,58E-08	0,006274	0,243291	98,95793
TA12-L6	L6	36	48,74	4,48153	28,805	1,37691	16,2657	0,498228	2,51E-09	0,017924	1,35E-08	0,009846	0,015479	1,56E-08	6,96E-09	0,003427	100,214
TA12-L6	L6	37	9,90991	51,8292	34,3243	0,633966	5,68038	0,64969	2,46E-09	0,078228	0,239481	0,025756	0,012745	0,078942	6,8E-09	0,001018	103,4636
TA12-L6	L6	38	0,163634	54,5135	37,2182	0,530741	6,77014	2,4E-09	2,44E-09	2,19E-09	0,140704	0,032543	0,097612	0,046431	6,74E-09	4,46E-09	99,51351
TA12-L6	L6	39	44,1505	11,2725	28,4381	1,1641	14,1894	0,403893	2,51E-09	0,004524	0,013444	0,006031	1,52E-08	0,070142	0,010768	0,203563	99,92697
TA12-L6	L6	40	43,6927	12,1919	28,5122	1,19655	13,9898	0,454124	2,51E-09	0,001482	0,029862	0,002457	0,081199	1,56E-08	6,95E-09	5,16E-09	100,1523

TA12-L6	L6	41	7,00361	46,4475	35,7718	0,724822	7,70887	0,056248	2,44E-09	2,19E-09	0,169711	0,025279	0,020329	0,093085	6,76E-09	0,121815	98,14307
TA12-L6	L6	42	44,7172	10,5669	28,3145	1,18276	14,3684	0,412647	2,51E-09	0,01924	0,024497	1,6E-08	1,52E-08	0,022844	6,96E-09	0,061586	99,69057
TA12-L6	L6	43	46,8414	7,08167	30,5137	1,26166	13,8419	0,422665	2,5E-09	0,01409	0,061499	1,58E-08	0,010297	0,032557	0,007351	5,13E-09	100,0888
TA12-L6	L6	44	55,0964	16,4692	17,862	0,933011	0,93059	5,79603	0,827509	0,428853	0,37296	0,001422	1,54E-08	0,006587	0,008558	0,059792	98,79291
TA12-L6	L6	45	39,752	16,9081	29,243	1,1469	13,5657	0,361588	2,5E-09	0,011884	0,025634	0,009336	0,024457	0,068417	6,93E-09	5,09E-09	101,117
TA12-L6	L6	46	49,2294	23,7998	17,1259	0,666828	1,07105	4,80434	1,094	0,539107	0,397741	1,69E-08	1,53E-08	0,065898	7,02E-09	5,94E-09	98,79406
TA12-L6	L6	47	19,3011	37,2397	33,9476	0,827954	9,20972	0,190054	2,46E-09	2,15E-09	0,167412	0,032573	0,07278	0,075856	6,82E-09	4,74E-09	101,0647
TA12-L3	L3	1	56,7558	16,4238	16,0606	0,721476	0,90443	5,40487	1,99617	0,546858	0,067057	1,7E-08	1,54E-08	0,014855	7,04E-09	6,09E-09	98,89592
TA12-L3	L3	2	41,7953	27,5178	23,825	0,5438	2,22443	3,13873	1,57208	0,373734	0,055663	0,013938	0,014198	0,037598	0,002809	5,52E-09	101,1151
TA12-L3	L3	3	55,5164	15,2035	20,9148	0,881621	4,05136	3,84281	1,20104	0,367165	0,04949	1,67E-08	0,020756	0,039455	0,011979	0,110475	102,2109
TA12-L3	L3	4	45,822	8,89356	29,6349	1,2194	14,4196	0,491624	2,51E-09	2,08E-09	0,005026	0,005569	0,036071	1,56E-08	0,001686	0,133818	100,6633
TA12-L3	L3	5	45,1706	9,59646	30,7296	1,16853	13,1826	0,444338	2,5E-09	0,000549	0,030447	0,002438	0,023153	0,107381	0,001121	0,002251	100,4595
TA12-L3	L3	6	56,2759	17,1433	15,5366	0,746728	1,03032	5,79954	1,54062	0,609262	0,073298	1,71E-08	0,010414	0,052849	7,04E-09	6,11E-09	98,81883
TA12-L3	L3	7	44,302	11,4845	28,329	1,10069	13,8582	0,41043	2,51E-09	2,06E-09	0,004277	0,007598	1,52E-08	1,56E-08	0,004502	5,16E-09	99,5012
TA12-L3	L3	8	45,7742	9,19385	28,8935	1,12397	14,5304	0,390856	2,51E-09	2,07E-09	0,008406	1,59E-08	0,023205	1,56E-08	0,006235	0,10347	100,0481
TA12-L3	L3	9	45,2553	10,0725	28,8308	1,10853	14,1249	0,421368	2,51E-09	2,07E-09	1,34E-08	0,021107	0,009023	0,022834	6,95E-09	5,16E-09	99,86636
TA12-L3	L3	10	39,8247	13,7716	29,9745	1,11153	13,5723	0,454373	2,5E-09	0,035465	0,020117	0,019691	0,029575	0,063436	0,007903	5,05E-09	98,88519
TA12-L3	L3	11	45,252	10,2112	29,9371	1,19913	13,2384	0,5305	2,5E-09	0,027325	0,014368	1,59E-08	1,52E-08	1,56E-08	6,94E-09	5,14E-09	100,41
TA12-L3	L3	12	18,3193	38,6468	32,7743	0,793636	10,4499	0,164989	2,47E-09	0,021429	0,006889	0,058486	1,5E-08	0,059818	0,008949	0,094988	101,3995
TA12-L3	L3	14	28,87	28,7884	31,4525	0,931587	9,51608	0,656297	2,48E-09	0,055095	0,003001	0,035859	0,033317	0,111828	6,87E-09	4,92E-09	100,454
TA12-L3	L3	15	46,8134	7,59354	31,7622	1,30933	11,4983	0,838884	2,5E-09	0,035383	0,03358	0,003761	1,51E-08	0,024368	6,92E-09	0,112811	100,0256
TA12-L3	L3	16	51,4952	15,9115	23,1513	0,966284	6,96065	2,56236	0,778814	0,400334	0,050606	0,001155	0,006454	0,057419	7E-09	5,59E-09	102,3421
TA12-L3	L3	17	40,5685	14,597	29,3434	1,18386	11,6062	1,0179	2,5E-09	0,061317	0,03624	1,59E-08	1,52E-08	1,56E-08	6,92E-09	5,13E-09	98,41442
TA12-L3	L3	18	0,756922	56,7427	35,4725	0,542084	7,04967	0,019749	2,45E-09	2,15E-09	0,05212	0,082524	0,008894	0,102749	0,001643	4,54E-09	100,8316
TA12-L3	L3	19	5,72767	51,5923	34,0488	0,607271	8,22583	0,04682	2,46E-09	2,13E-09	0,033601	0,095601	0,015281	0,107848	6,79E-09	4,61E-09	100,501
TA12-L3	L3	20	50,497	20,5829	17,9231	0,653331	1,22784	5,74095	1,00391	0,500701	0,039604	0,005438	1,53E-08	0,018108	0,006839	5,94E-09	98,19972
TA12-L3	L3	21	22,4303	35,6063	31,4469	0,815062	10,9636	0,205426	2,48E-09	0,019051	0,037303	0,055528	0,051236	0,098845	6,86E-09	0,044444	101,774
TA12-L3	L3	22	13,5319	43,8606	33,5264	0,702218	9,12586	0,143654	2,46E-09	0,000972	0,01378	0,065531	1,5E-08	0,140339	6,82E-09	0,020051	101,1313
TA12-L3	L3	24	50,5223	21,2466	18,6637	0,784514	1,82666	4,73861	0,904375	0,544314	0,052091	1,68E-08	1,53E-08	1,58E-08	0,002838	0,094058	99,38006
TA12-L3	L3	25	47,184	21,2307	21,4387	0,708781	1,88694	4,58773	0,677338	0,518347	0,044171	0,011395	0,03106	1,57E-08	6,98E-09	5,71E-09	98,31916
TA12-L3	L3	26	54,8658	17,2133	17,0954	0,800997	0,952346	6,5637	0,806581	0,538071	0,074193	1,7E-08	1,54E-08	1,58E-08	0,005137	6,05E-09	98,91553
TA12-L3	L3	27	5,4719	54,9922	34,1059	0,58084	7,06456	0,139489	2,46E-09	0,048643	0,010009	0,024564	0,00253	0,149767	0,012793	4,64E-09	102,6032
TA12-L3	L3	28	55,8276	17,1387	15,8732	0,760174	0,73958	6,81499	0,789955	0,611955	0,047168	1,7E-08	0,052058	0,023112	7,04E-09	6,12E-09	98,67849
TA12-L3	L3	29	35,737	19,7484	29,6413	0,961775	13,7688	0,296969	2,5E-09	2,08E-09	0,019275	0,034559	0,002557	0,022783	0,010728	0,114749	100,3589
TA12-L3	L3	31	36,964	21,1533	29,0023	0,986282	11,7382	0,910808	2,5E-09	0,029807	0,024694	0,000445	0,010292	0,092802	6,92E-09	5,09E-09	100,9129
TA12-L3	L3	32	44,8255	11,4817	28,4618	1,08754	14,5644	0,327121	2,51E-09	0,004249	0,014033	0,003354	0,002567	0,02938	6,96E-09	0,046718	100,8484
TA12-L3	L3	33	9,6705	49,2328	33,7364	0,665594	8,01607	0,124306	2,46E-09	2,12E-09	0,007186	0,042902	1,5E-08	0,14506	6,81E-09	4,67E-09	101,6408
TA12-L3	L3	34	28,3182	30,3243	30,1648	0,866716	12,4683	0,232566	2,49E-09	2,07E-09	0,003906	0,057273	1,51E-08	0,107262	0,000558	0,159743	102,7036
TA12-L3	L3	35	47,1699	7,10273	28,5078	1,11518	15,4644	0,373945	2,51E-09	0,02238	0,009084	0,004922	0,014189	0,035913	6,96E-09	5,18E-09	99,82044
TA12-L3	L3	36	46,4433	6,82109	31,1175	1,27765	13,2268	0,469227	2,5E-09	0,009548	0,007461	1,58E-08	0,029582	1,56E-08	6,93E-09	5,1E-09	99,40216
TA12-L3	L3	38	46,3686	7,81165	27,4917	1,08073	15,6615	0,357101	2,52E-09	2,05E-09	0,005098	1,6E-08	1,52E-08	0,019608	0,003385	0,060656	98,86003
TA12-L3	L3	39	44,2025	7,31042	31,0687	1,25478	13,8628	0,408519	2,5E-09	2,12E-09	0,005185	1,57E-08	1,51E-08	0,03413	0,002239	0,033523	98,1828

TA12-L3	L3	40	2,82161	54,6174	32,8901	0,532158	8,06666	0,045176	2,46E-09	2,11E-09	0,021169	0,074155	1,5E-08	0,08213	0,0022	0,057013	99,20977
TA12-L3	L3	41	54,2214	19,1302	16,4191	0,735014	1,55704	5,5004	0,987613	0,531562	0,023753	0,018398	0,026023	1,59E-08	7,04E-09	6,03E-09	99,1505
TA12-L3	L3	42	46,7537	6,98934	28,8181	1,15167	15,4164	0,394488	2,51E-09	0,005452	1,35E-08	1,59E-08	1,52E-08	0,053839	6,96E-09	0,115981	99,69897
TA12-L3	L3	43	33,3221	21,0538	31,5149	0,970689	13,0888	0,259858	2,49E-09	2,11E-09	0,022467	0,028252	0,006376	0,025969	0,007314	0,090016	100,3905
TA12-L3	L3	44	47,2223	7,444	28,0086	1,11824	15,4538	0,444912	2,51E-09	2,05E-09	0,020447	0,005157	1,52E-08	0,026133	0,001692	5,2E-09	99,74528
TA12-L3	L3	45	28,6116	30,6433	28,6374	0,773948	12,4861	0,21507	2,5E-09	2,05E-09	0,00274	0,037373	1,51E-08	0,122086	6,91E-09	4,98E-09	101,5296
TA12-L3	L3	47	43,9231	30,1672	18,6156	0,688471	2,36258	4,62688	0,540278	0,462261	0,073848	0,024851	1,53E-08	1,58E-08	0,001701	0,093019	101,5798
TA12-L3	L3	48	44,0224	11,1697	28,3223	1,13565	14,0514	0,456273	2,51E-09	0,019124	0,002993	0,0105	1,52E-08	0,006526	6,95E-09	0,116124	99,31299
TA12-L3	L3	49	34,266	20,2603	30,6641	1,01027	13,361	0,311987	2,49E-09	0,003261	0,004326	0,029234	1,51E-08	0,107218	0,002232	0,122581	100,1425
TA12-L3	L3	50	23,5021	34,9333	30,5642	0,754386	10,8734	0,186688	2,48E-09	2,08E-09	1,33E-08	0,024696	1,51E-08	0,100581	0,003894	0,071914	101,0152
LKTA38-00	L2	1	39,0477	21,2376	27,3598	0,780836	9,30131	2,091	2,5E-09	0,018589	0,012171	0,03336	1,52E-08	0,084784	6,93E-09	0,09227	
LKTA38-00	L2	2	38,9377	21,5847	27,2431	0,757415	9,25586	2,0725	2,5E-09	2,04E-09	0,013405	0,033603	1,52E-08	1,56E-08	6,93E-09	5,24E-09	
LKTA38-00	L2	3	39,0918	21,5648	27,4984	0,7406	9,36143	2,08966	2,5E-09	2,04E-09	0,036062	0,007426	0,028344	1,56E-08	0,003925	5,23E-09	
LKTA38-00	L2	4	38,6604	21,4656	27,6079	0,802899	9,2657	2,06792	2,5E-09	2,05E-09	0,013392	0,034013	0,015456	0,00162	0,003362	0,082914	
LKTA38-00	L2	5	38,8471	21,4655	27,3762	0,795408	9,41582	2,04256	2,5E-09	2,05E-09	0,002815	0,041122	0,018031	0,092933	6,93E-09	0,059951	
LKTA38-00	L2	6	38,8186	21,3022	27,2411	0,773734	9,31757	2,08217	2,5E-09	2,04E-09	0,047342	0,028795	0,025767	1,56E-08	6,93E-09	5,23E-09	
LKTA38-00	L2	7	38,928	21,3877	27,7428	0,809566	9,30408	2,01935	2,5E-09	2,05E-09	0,049513	0,04542	1,52E-08	0,048895	0,016953	5,22E-09	
LKTA38-00	L2	8	39,0036	21,297	27,4777	0,761843	9,23769	2,04183	2,5E-09	0,020389	0,031614	0,030833	1,52E-08	0,04402	0,002803	5,23E-09	
LKTA38-00	L2	9	38,9394	21,368	27,1405	0,745929	9,3242	2,03485	2,5E-09	0,001598	0,031057	0,010132	0,021908	0,01631	0,011877	0,104995	
LKTA38-00	L2	10	38,9309	21,5044	27,1504	0,768218	9,28175	2,06005	2,5E-09	2,04E-09	0,013888	0,029035	1,52E-08	0,050558	6,93E-09	5,24E-09	
LKTA38-00	L2	11	38,8624	21,5158	27,2863	0,759801	9,25915	2,05449	2,5E-09	0,003201	0,014608	0,020567	1,52E-08	0,013046	0,002804	5,23E-09	
LKTA38-00	L2	12	38,8058	21,3458	27,4484	0,776009	9,22381	2,07982	2,5E-09	0,000668	0,014698	0,020554	0,00641	0,030975	6,93E-09	0,003456	
LKTA38-00	L2	13	38,837	21,1332	27,0781	0,776732	9,23751	2,0469	2,5E-09	0,024457	0,031002	0,024	0,009019	0,022831	0,009613	0,049651	
LKTA38-00	L2	14	38,4941	21,5134	27,6097	0,783499	9,40541	2,04261	2,5E-09	0,002181	0,033528	0,009888	1,52E-08	0,04238	6,93E-09	5,21E-09	
LKTA38-00	L2	15	38,8215	21,3261	27,4132	0,802247	9,31623	2,03826	2,5E-09	0,004235	0,032525	0,036771	0,01674	0,118998	0,005652	0,096792	
LKTA38-00	L2	16	38,9484	21,4226	27,3809	0,792111	9,30559	1,9841	2,5E-09	0,000934	0,014651	0,044317	1,52E-08	0,037502	0,010743	5,23E-09	
LKTA38-00	L2	17	38,8262	21,326	27,657	0,788905	9,34933	2,04676	2,5E-09	0,00475	0,019028	0,028761	1,52E-08	0,05216	0,00056	5,22E-09	
LKTA38-00	L2	18	38,7303	21,6313	27,3883	0,811251	9,2536	2,02755	2,5E-09	0,014479	0,007205	0,033578	0,012883	1,56E-08	0,000561	0,009221	
LKTA38-00	L2	19	38,6823	21,4749	27,6963	0,770551	9,34906	2,02615	2,5E-09	0,0113	0,012957	0,026244	1,52E-08	0,09616	6,93E-09	0,033328	
LKTA38-00	L2	20	38,8253	21,3192	27,4171	0,810933	9,26267	2,03963	2,5E-09	0,01321	0,011832	0,004722	1,52E-08	0,052169	6,93E-09	0,028794	
LKTA38-00	L2	21	38,5778	21,3797	27,2347	0,766887	9,25062	2,04464	2,5E-09	0,011146	0,010928	0,023302	1,52E-08	0,026088	0,003925	5,23E-09	
LKTA38-00	L2	22	38,7194	21,3618	27,6024	0,772735	9,30676	2,13095	2,5E-09	0,011552	0,018887	0,036303	1,52E-08	0,03586	0,004483	0,013815	
LKTA38-00	L2	23	38,5638	21,3782	27,3839	0,715619	9,35347	2,08282	2,5E-09	0,002948	0,050848	0,023298	1,52E-08	0,068472	0,01187	5,22E-09	
LKTA38-00	L2	24	38,8036	21,6251	27,5086	0,754927	9,32729	2,03237	2,5E-09	0,010764	0,026267	0,020557	0,002564	1,56E-08	0,005653	0,053004	
LKTA38-00	L2	25	38,7956	21,4234	27,3437	0,785268	9,34939	2,04186	2,5E-09	0,00359	0,056968	0,021476	0,010303	0,099451	6,93E-09	0,086466	
LKTA38-00	L2	26	38,8815	21,2379	27,2582	0,75256	9,20315	2,07724	2,5E-09	2,04E-09	0,030372	0,035876	1,52E-08	1,56E-08	0,006219	0,089999	
LKTA38-00	L2	27	38,8863	21,3529	27,556	0,799105	9,38257	2,05577	2,5E-09	0,000401	0,022983	0,032197	0,0644	0,019563	6,93E-09	0,109412	
LKTA38-00	L2	28	38,7137	21,4287	27,6238	0,742113	9,30553	2,01574	2,5E-09	0,01155	0,01296	0,043371	0,009016	1,56E-08	0,013564	0,090889	
LKTA38-00	L2	29	38,795	21,3149	27,6529	0,732149	9,28891	2,06844	2,5E-09	2,05E-09	0,018596	0,05136	1,52E-08	0,039121	6,93E-09	5,22E-09	
LKTA38-00	L2	30	38,7372	21,3054	27,62	0,802226	9,29876	2,0877	2,5E-09	0,000401	0,010206	0,063234	1,52E-08	0,00324	0,001681	0,063372	
LKTA38-00	L2	31	38,8116	21,3912	27,1931	0,770196	9,27278	2,07616	2,5E-09	0,022529	0,003581	0,012154	0,019327	1,56E-08	6,93E-09	5,23E-09	
LKTA38-00	L2	32	38,7925	21,4419	27,7134	0,810788	9,31531	2,11208	2,5E-09	0,008988	0,044608	0,044517	1,52E-08	1,56E-08	6,92E-09	0,059926	

LKTA38-00	L2	33	38,7398	21,267	27,495	0,775709	9,26409	1,99498	2,5E-09	0,015269	0,026497	0,030819	1,52E-08	0,024453	6,93E-09	0,019565	
LKTA38-00	L2	34	38,6157	21,4816	27,2327	0,742909	9,12609	2,01977	2,5E-09	0,015891	0,007349	0,037463	1,52E-08	0,089671	6,93E-09	5,22E-09	
LKTA38-00	L2	35	38,7458	21,3782	27,7477	0,776907	9,30633	2,0688	2,5E-09	0,008091	0,021483	1,6E-08	1,52E-08	0,040747	0,003362	5,21E-09	
LKTA38-00	L2	36	38,9014	21,4633	27,4283	0,766586	9,32063	2,05056	2,5E-09	2,05E-09	0,037159	0,059169	0,025762	0,037499	0,003924	0,012679	
LKTA38-00	L2	37	38,232	21,5044	27,1866	0,775304	9,21399	2,04273	2,5E-09	0,008718	0,024143	0,047966	0,027049	0,029345	6,93E-09	0,04611	
LKTA38-00	L2	38	39,0526	21,5221	27,1391	0,768465	9,13091	2,04649	2,5E-09	0,009853	0,021074	0,014862	1,52E-08	0,048928	6,93E-09	0,016161	
LKTA38-00	L2	39	38,9274	21,6139	27,2834	0,793796	9,32725	2,05139	2,5E-09	2,04E-09	0,023383	0,024456	1,52E-08	0,068488	0,013006	5,23E-09	
LKTA38-00	L2	40	38,6877	21,5298	27,5357	0,783154	9,25363	2,06301	2,5E-09	0,008211	0,022935	0,043385	0,020609	1,56E-08	6,93E-09	0,048401	
LKTA38-00	L2	41	38,7042	21,5634	27,5111	0,757944	9,13903	2,07562	2,5E-09	0,010133	0,006775	0,010567	0,014169	0,014672	6,93E-09	5,22E-09	
LKTA38-00	L2	42	38,7118	21,5193	27,3357	0,785382	9,21927	2,1116	2,5E-09	2,05E-09	0,025306	0,051869	1,52E-08	0,004861	0,003924	0,174129	
LKTA38-00	L2	43	38,6097	21,303	27,2714	0,805206	9,22941	2,14747	2,5E-09	0,012953	0,005584	0,027189	1,52E-08	1,56E-08	6,93E-09	0,20863	
LKTA38-00	L2	44	38,6976	21,361	27,3608	0,700634	9,20539	2,07553	2,5E-09	2,05E-09	0,011073	0,026497	1,52E-08	1,56E-08	0,021482	0,020725	
LKTA38-00	L2	45	38,817	21,3921	27,6575	0,77382	9,21203	2,12013	2,5E-09	0,006163	0,017055	0,026937	0,006408	0,037489	6,93E-09	5,22E-09	
LKTA38-00	L2	46	38,8495	21,2798	27,5966	0,719176	9,12222	2,07683	2,5E-09	0,007574	0,014696	0,012588	1,52E-08	1,56E-08	6,93E-09	0,04256	
LKTA38-00	L2	47	38,692	21,1583	27,5408	0,76731	9,15337	2,09843	2,5E-09	2,05E-09	0,014356	0,035154	1,52E-08	0,01304	6,93E-09	0,204787	
LKTA38-00	L2	48	38,6449	21,2852	27,5217	0,78759	9,16976	2,08159	2,5E-09	0,010271	0,017632	0,02785	1,52E-08	0,01793	0,001121	0,021873	
LKTA38-00	L2	49	38,6892	21,1905	27,281	0,746052	9,08335	2,13343	2,5E-09	0,006286	0,007874	0,038604	0,045086	1,56E-08	0,005652	5,23E-09	
LKTA38-00	L2	50	38,6253	21,0474	27,3241	0,75681	9,06775	2,11297	2,5E-09	2,05E-09	0,020866	0,001349	0,029626	0,00162	6,93E-09	0,038	
TA12-005	L2	1	38,9972	21,5185	27,9313	1,03932	9,15818	2,09578	2,5E-09	0,026645	0,020264	0,028058	0,033468	0,065166	6,92E-09	5,23E-09	
TA12-005	L2	2	38,9529	21,2831	27,6396	1,04395	9,19566	2,12008	2,5E-09	0,009383	0,012014	0,007417	1,52E-08	0,052146	6,92E-09	5,24E-09	
TA12-005	L2	3	39,0929	21,3438	27,8837	1,02847	9,18478	2,02709	2,5E-09	0,020454	0,024405	0,002021	1,52E-08	0,040735	6,92E-09	5,23E-09	
TA12-005	L2	4	38,9854	21,3638	27,7207	1,0775	9,13885	2,12235	2,5E-09	2,05E-09	0,010773	0,01803	1,52E-08	1,56E-08	0,014686	0,041567	
TA12-005	L2	5	39,0602	21,6301	28,1376	1,08207	9,1593	2,11678	2,5E-09	0,003864	0,019538	0,01639	1,52E-08	0,022807	6,92E-09	0,034581	
TA12-005	L2	6	39,0199	21,5261	28,0563	1,08477	9,23622	2,06588	2,5E-09	2,06E-09	0,023484	0,010328	0,024459	0,022807	0,00112	5,23E-09	
TA12-005	L2	7	39,0181	21,2448	28,13	1,07246	9,04977	2,10759	2,5E-09	0,003612	0,02444	0,015934	1,52E-08	0,01466	6,92E-09	0,117543	
TA12-005	L2	8	39,0765	21,4523	28,0172	1,03678	9,11011	2,08108	2,5E-09	0,007856	1,35E-08	1,6E-08	1,52E-08	0,099371	6,92E-09	0,014974	
TA12-005	L2	9	39,0532	21,3735	27,5911	1,06369	9,08374	2,1276	2,5E-09	0,01041	0,011873	0,03265	1,52E-08	0,006519	6,92E-09	0,070544	
TA12-005	L2	10	39,0422	21,5372	27,9666	1,07997	9,0947	2,09188	2,5E-09	0,008882	0,027675	0,006738	1,52E-08	0,011405	6,92E-09	0,04152	
TA12-005	L2	11	39,1037	21,524	27,9014	1,064	9,07458	2,1221	2,5E-09	2,06E-09	0,026907	1,6E-08	0,018017	0,159641	6,92E-09	0,079608	
TA12-005	L2	12	39,0966	21,4951	27,8562	1,0099	9,03067	2,08771	2,5E-09	2,05E-09	1,35E-08	0,017797	1,52E-08	1,56E-08	0,004481	0,086541	
TA12-005	L2	13	38,8312	21,5401	27,8099	1,04418	9,03219	2,142	2,5E-09	0,012998	0,003241	1,6E-08	0,0412	0,001619	0,011295	0,053087	
TA12-005	L2	14	39,0922	21,4779	28,1029	1,05099	9,11686	2,1657	2,5E-09	0,018163	0,034121	0,037405	0,002562	0,034209	6,92E-09	5,23E-09	
TA12-005	L2	15	39,137	21,4671	27,953	1,04062	9,00499	2,14199	2,5E-09	0,021108	1,35E-08	0,009659	1,52E-08	0,011405	6,92E-09	5,23E-09	
TA12-005	L2	16	39,2344	21,5421	27,8364	1,03556	9,0136	2,11287	2,5E-09	0,004246	0,021909	0,00472	0,016738	0,039108	0,007908	0,147734	
TA12-005	L2	17	38,9232	21,4656	28,0333	1,07601	8,9984	2,13931	2,5E-09	0,002013	0,014098	0,023029	1,52E-08	0,086323	6,92E-09	5,23E-09	
TA12-005	L2	18	39,0515	21,5058	27,9163	1,07825	9,04558	2,14393	2,5E-09	0,022906	0,027054	1,6E-08	1,52E-08	1,56E-08	0,00224	0,00808	
TA12-005	L2	19	39,075	21,316	27,6537	1,0469	9,05571	2,11263	2,5E-09	0,0099	0,028121	0,030359	0,014165	0,009778	6,92E-09	5,24E-09	
TA12-005	L2	20	39,0145	21,1777	27,9578	1,00584	9,00669	2,14302	2,5E-09	0,006056	0,02551	0,011678	1,52E-08	1,56E-08	0,007341	0,092248	
TA12-005	L2	21	39,1687	21,199	28,3028	1,01597	9,02827	2,08772	2,5E-09	0,010842	0,018759	0,03714	1,52E-08	0,0684	0,001679	5,22E-09	
TA12-005	L2	22	39,0796	21,2184	27,6475	1,057	9,07699	2,14133	2,5E-09	0,021089	0,006293	0,029902	1,52E-08	0,040738	6,92E-09	5,24E-09	
TA12-005	L2	23	38,94	21,4778	27,611	1,05638	8,9315	2,12711	2,5E-09	0,004757	0,011776	0,016892	1,52E-08	0,009778	0,002241	0,024262	
TA12-005	L2	24	38,8794	21,3292	27,7617	1,03797	9,07146	2,14539	2,5E-09	0,010687	0,019544	0,026238	0,047627	0,071682	0,00112	5,23E-09	

TA12-005	L2	25	39,1476	21,4132	27,8612	1,06333	9,03386	2,1289	2,5E-09	0,006692	0,024215	0,004269	1,52E-08	0,068428	0,005083	5,24E-09	
TA12-005	L2	26	39,0983	21,0649	27,9469	1,05545	9,02051	2,1363	2,5E-09	0,006058	0,024399	0,010778	0,007686	0,053755	6,92E-09	5,23E-09	
TA12-005	L2	27	39,0104	21,0853	27,7164	1,02876	9,06886	2,13315	2,5E-09	2,05E-09	1,35E-08	0,00337	0,025753	1,56E-08	6,92E-09	0,064645	
TA12-005	L2	28	39,1358	21,2481	27,8158	1,02691	9,05441	2,15929	2,5E-09	0,011454	0,016033	0,00382	1,52E-08	0,060285	6,92E-09	5,24E-09	
TA12-005	L2	29	38,9699	21,4105	27,6627	1,04239	8,96208	2,09192	2,5E-09	0,015175	0,029178	0,020312	1,52E-08	1,56E-08	6,92E-09	0,049691	
TA12-005	L2	30	39,1167	21,4304	28,1861	1,056	9,11427	2,10991	2,5E-09	0,016886	0,023817	0,022342	0,019307	0,047236	0,005646	5,23E-09	
TA12-005	L2	31	39,0698	21,2967	27,8784	1,0267	9,08625	2,15724	2,5E-09	0,007722	0,026431	1,6E-08	0,005125	0,009776	6,92E-09	0,008076	
TA12-005	L2	32	39,1016	21,1728	27,7996	1,07399	9,01697	2,14012	2,5E-09	0,012238	0,036534	0,022815	0,034754	0,07168	6,92E-09	0,032318	
TA12-005	L2	33	39,2115	21,3064	27,625	1,0918	8,961	2,15464	2,5E-09	0,010934	0,044975	0,003822	1,52E-08	0,123829	6,92E-09	5,25E-09	
TA12-004	L4	1	38,7728	21,3355	27,9477	1,04443	8,85585	2,10804	2,5E-09	0,00245	0,008144	0,019376	1,52E-08	0,087949	6,92E-09	5,23E-09	
TA12-004	L4	2	38,8045	20,9132	27,6443	1,06885	8,80906	2,0817	2,5E-09	2,06E-09	0,030848	0,021894	1,52E-08	1,56E-08	0,009035	0,060054	
TA12-004	L4	3	38,8902	21,1632	27,7392	1,03192	8,90637	2,08352	2,5E-09	2,06E-09	0,025795	0,022807	1,52E-08	0,171026	6,92E-09	5,23E-09	
TA12-004	L4	4	38,7478	21,0977	28,1817	1,0607	8,88856	2,13501	2,5E-09	0,011753	0,022892	1,6E-08	0,005123	1,56E-08	0,005644	5,22E-09	
TA12-004	L4	5	38,8648	21,1269	27,7456	1,05151	8,85792	2,17403	2,5E-09	0,00335	0,006862	0,002696	0,009011	0,030952	0,010164	5,24E-09	
TA12-004	L4	6	38,6675	21,391	27,9087	1,03971	8,918	2,13634	2,5E-09	0,01521	0,018864	1,6E-08	1,52E-08	0,008145	6,92E-09	0,130219	
TA12-004	L4	7	38,6419	21,1247	27,7637	1,05969	8,92223	2,13027	2,5E-09	0,021266	0,003763	0,034432	0,029608	1,56E-08	0,007904	5,23E-09	
TA12-004	L4	8	38,7403	21,0008	27,8083	1,03197	8,83829	2,11292	2,5E-09	2,06E-09	0,011813	0,004265	0,002562	0,037464	0,00734	0,085304	
TA12-004	L4	9	38,8495	21,0878	27,9152	1,06459	8,89436	2,07512	2,5E-09	0,010062	0,031802	0,000224	0,024458	1,56E-08	6,92E-09	0,08646	
TA12-004	L4	10	38,8534	21,1529	27,665	1,07156	8,99588	2,18172	2,5E-09	2,06E-09	0,02975	0,023959	0,006405	0,084712	0,003919	5,24E-09	
TA12-004	L4	11	38,7898	21,143	27,8952	1,02569	8,82051	2,07911	2,5E-09	0,025528	0,025694	1,6E-08	1,52E-08	0,008145	6,92E-09	0,011521	
TA12-004	L4	12	38,6094	21,1394	27,5843	1,07017	8,75778	2,08892	2,5E-09	0,013792	0,001	0,023261	1,52E-08	0,133561	0,00224	5,23E-09	
TA12-004	L4	13	38,7796	21,3471	27,8647	1,07906	8,81307	2,14305	2,5E-09	0,006316	0,027044	1,6E-08	0,011585	0,019547	6,92E-09	5,23E-09	
TA12-004	L4	14	38,6672	21,0682	28,057	1,03961	8,99079	2,14398	2,5E-09	0,015358	1,35E-08	0,015255	1,52E-08	0,04397	6,92E-09	5,22E-09	
TA12-004	L4	15	38,7544	21,357	27,9829	1,06519	8,76635	2,12325	2,5E-09	0,01329	0,005239	0,004264	0,020595	1,56E-08	0,006774	0,122148	
TA12-004	L4	16	38,5651	21,1948	27,7954	1,05567	8,93254	2,1259	2,5E-09	0,008121	0,006097	0,006735	0,010298	1,56E-08	0,006775	0,110662	
TA12-004	L4	17	38,7599	21,3285	27,7654	1,03387	8,92972	2,10598	2,5E-09	0,013524	0,038406	0,023722	1,52E-08	0,078192	0,00056	5,23E-09	
TA12-004	L4	18	38,6762	20,9843	27,4928	1,04335	8,94861	2,12126	2,5E-09	0,000804	0,030041	0,02898	1,52E-08	0,026069	0,007907	0,064699	
TA12-004	L4	19	38,7024	21,0955	27,9388	1,03045	8,87918	2,11229	2,5E-09	2,06E-09	0,013903	0,027806	1,52E-08	0,058631	6,92E-09	0,086408	
TA12-004	L4	20	38,8243	21,2033	28,0294	1,05339	8,81104	2,01005	2,5E-09	0,011099	0,01114	0,018911	0,021882	1,56E-08	0,00112	0,049534	
TA12-004	L4	21	38,7855	21,2069	27,9103	1,05085	8,89937	2,12778	2,5E-09	2,06E-09	0,024973	0,007632	1,52E-08	0,045607	0,009033	0,055357	
TA12-004	L4	22	38,8581	21,0442	27,6948	1,04224	8,92345	2,15615	2,5E-09	0,01005	0,021901	0,011906	0,054067	0,026066	6,92E-09	5,24E-09	
TA12-004	L4	23	38,7266	21,2772	28,4106	1,02217	8,76172	2,15508	2,5E-09	0,003882	0,011943	0,010533	0,03859	0,105808	6,91E-09	5,21E-09	
TA12-004	L4	24	38,8278	21,1649	27,8185	1,03689	8,90762	2,1006	2,5E-09	2,06E-09	1,35E-08	0,013021	0,002561	0,105876	0,003919	0,124456	
TA12-004	L4	25	38,797	21,2084	28,0474	1,00218	8,87643	2,07336	2,5E-09	0,011479	0,008048	0,018915	1,52E-08	1,56E-08	0,01355	5,22E-09	
TA12-004	L4	26	38,6744	21,1798	27,8145	1,03689	8,85655	2,08559	2,5E-09	2,06E-09	0,049127	1,6E-08	1,52E-08	0,060266	0,003919	5,23E-09	
TA12-004	L4	27	38,7064	21,4045	27,687	1,07999	8,91028	2,09742	2,5E-09	0,007598	1,35E-08	0,030566	0,028317	0,070048	0,006777	5,23E-09	
TA12-004	L4	28	38,6585	21,4677	27,9498	1,00757	8,84628	2,08403	2,5E-09	2,06E-09	0,035171	0,01892	1,52E-08	0,058636	0,001679	5,22E-09	
TA12-004	L4	29	38,7258	21,198	27,9058	1,03285	8,90238	2,08021	2,5E-09	0,02824	0,025356	0,007182	1,52E-08	0,032577	0,002239	0,099079	
TA12-004	L4	30	38,6804	21,2182	28,0465	1,01027	8,95125	2,08541	2,5E-09	0,006449	0,004809	0,012563	1,52E-08	1,56E-08	0,002239	0,034516	
TA12-004	L4	31	38,7091	21,2777	27,9419	1,07863	8,88421	2,09194	2,5E-09	0,009031	0,005762	0,036469	0,04505	1,56E-08	0,004478	0,038023	
TA12-004	L4	32	38,6914	21,3192	27,7753	1,04562	8,76267	2,05911	2,5E-09	0,014957	0,020882	0,018468	1,52E-08	0,099356	6,92E-09	0,064574	
TA12-004	L4	33	38,6944	21,0542	27,4755	1,02474	8,8745	2,0851	2,5E-09	0,00772	0,016851	0,008988	0,003844	1,56E-08	6,92E-09	5,24E-09	

TA12-004	L5	1	38,6636	21,1009	27,8637	1,05977	8,79689	2,12404	2,5E-09	2,06E-09	0,014337	0,020287	1,52E-08	0,026059	0,016936	5,23E-09	
TA12-004	L5	2	38,7726	21,0262	27,8191	1,03315	8,83538	2,09613	2,5E-09	0,010442	1,35E-08	0,008305	0,007687	1,56E-08	0,009599	5,23E-09	
TA12-004	L5	3	34,1754	15,9851	17,6049	0,68816	5,76463	1,89375	0,059903	0,030511	0,080501	0,005975	0,011644	0,054097	0,02961	5,5E-09	
TA12-004	L5	4	38,6022	21,1613	27,8349	1,0453	8,90912	2,08584	2,5E-09	0,005676	0,027037	0,023023	0,006403	0,089576	6,92E-09	0,047261	
TA12-004	L5	5	38,6523	21,4245	28,22	1,09038	8,86886	2,12338	2,5E-09	0,021693	0,0277	0,012784	1,52E-08	1,56E-08	0,014108	0,055293	
TA12-004	L5	6	38,6424	21,1707	27,5699	1,01385	8,89645	2,06473	2,5E-09	2,05E-09	0,02585	0,008536	0,005126	1,56E-08	6,92E-09	5,23E-09	
TA12-004	L5	7	38,6567	21,1543	27,577	1,04411	8,77536	2,15435	2,5E-09	2,06E-09	0,017715	0,001123	0,002562	0,048873	6,92E-09	5,24E-09	
TA12-004	L5	8	38,7004	21,0371	27,8727	1,01129	8,95693	2,12103	2,5E-09	0,012117	0,006907	0,007856	1,52E-08	0,013031	0,010163	5,22E-09	
TA12-004	L5	9	38,6765	21,1244	28,4242	1,06332	8,87053	2,16362	2,5E-09	0,003363	0,01572	0,023677	1,52E-08	1,56E-08	0,009026	0,042535	
TA12-004	L5	10	38,6602	21,2054	28,1692	1,01836	8,75409	2,09865	2,5E-09	0,006587	0,003523	0,013453	1,52E-08	1,56E-08	6,92E-09	5,22E-09	
TA12-004	L5	11	38,8258	21,1199	28,1182	1,04372	8,86725	2,0992	2,5E-09	0,021189	0,004475	0,022327	1,52E-08	0,110728	6,92E-09	0,144958	
TA12-004	L5	12	38,7197	21,3453	28,1681	1,01706	9,01251	2,17683	2,5E-09	2,06E-09	0,025929	0,002244	0,010294	0,079794	0,010724	5,22E-09	
TA12-004	L5	13	38,7452	21,1301	27,8008	1,04431	8,93981	2,16444	2,5E-09	0,020241	0,002573	0,016391	0,051484	0,048866	6,92E-09	5,23E-09	
TA12-004	L5	14	38,6019	21,0176	27,7488	1,06959	9,03438	2,14231	2,5E-09	0,010312	0,000191	0,005613	0,048917	1,56E-08	6,92E-09	0,0219	
TA12-004	L5	15	38,6779	21,2167	28,1146	1,10093	8,96627	2,16398	2,5E-09	2,06E-09	0,029098	0,008076	0,029597	0,032567	0,010722	5,22E-09	
TA12-004	L5	16	38,7687	21,2399	27,6929	1,02632	8,89256	2,17043	2,5E-09	2,06E-09	0,000953	0,031255	1,52E-08	0,053761	6,92E-09	5,24E-09	
TA12-004	L5	17	38,7614	21,2925	27,9833	1,06074	8,83431	2,13085	2,5E-09	0,018957	0,021795	0,010549	1,52E-08	1,56E-08	6,92E-09	5,23E-09	
TA12-004	L5	18	38,7773	21,1393	27,9635	1,03065	8,80687	2,09421	2,5E-09	0,028519	0,004762	0,019143	0,038612	0,026059	6,92E-09	5,22E-09	
TA12-004	L5	19	38,7603	21,426	27,6209	1,02075	8,82611	2,14656	2,5E-09	0,002703	0,037264	0,013034	0,01416	0,066798	6,92E-09	5,24E-09	
TA12-004	L5	20	38,7282	21,2634	28,0492	1,04265	8,89075	2,11765	2,5E-09	0,009677	0,017559	0,008078	1,52E-08	0,01303	0,004478	0,074882	
TA12-004	L5	21	38,7533	21,3649	27,919	1,09641	8,90006	2,06938	2,5E-09	0,007608	0,013951	0,017097	0,003842	0,083062	0,006211	5,23E-09	
TA12-004	L5	22	38,5883	21,0554	27,8015	1,04902	8,81532	2,12307	2,5E-09	0,012134	0,026892	0,017324	0,046325	0,086312	0,003358	0,047265	
TA12-004	L5	23	38,8264	21,0592	27,6784	1,06621	8,87544	2,13318	2,5E-09	0,002707	0,030224	0,029881	0,0399	0,070044	6,92E-09	0,026542	
TA12-004	L5	24	38,6873	21,1228	27,7372	1,05166	8,85065	2,12415	2,5E-09	0,02255	0,026708	0,037401	1,52E-08	0,008145	0,00734	5,24E-09	
TA12-004	L5	25	38,6149	21,1071	27,6257	1,06294	8,93053	2,07497	2,5E-09	2,06E-09	0,01463	0,026228	1,52E-08	0,047243	6,92E-09	5,23E-09	
TA12-004	L5	26	38,5356	21,32	27,7237	1,01503	8,85063	2,12592	2,5E-09	2,06E-09	1,35E-08	0,018699	0,060494	0,045609	0,012422	0,003457	
TA12-004	L5	27	38,8	21,2554	28,1543	1,04264	9,06822	2,13048	2,5E-09	0,010838	0,023283	0,00516	0,020594	1,56E-08	6,92E-09	0,058738	
TA12-004	L5	28	38,6377	21,4599	27,8642	1,0728	8,94736	2,12344	2,5E-09	0,00232	0,044416	1,6E-08	1,52E-08	0,024434	6,92E-09	0,118784	
TA12-004	L5	29	38,5156	21,3503	27,6551	1,01637	8,91294	2,14551	2,5E-09	2,06E-09	0,038412	0,007862	1,52E-08	0,061904	0,009035	0,02537	
TA12-004	L5	30	38,7805	21,4414	27,7806	1,08282	9,02312	2,1077	2,5E-09	0,010169	1,35E-08	0,031936	0,007687	0,030954	6,92E-09	5,24E-09	
TA12-004	L5	31	38,5546	21,2164	27,9838	1,03653	8,95861	2,14045	2,5E-09	2,06E-09	0,019483	0,017321	1,52E-08	0,034201	0,004477	0,010364	
TA12-004	L5	32	38,5108	21,2708	27,7811	1,04051	8,89257	2,09696	2,5E-09	0,009021	0,002715	0,002469	1,52E-08	0,047237	6,92E-09	5,22E-09	
TA12-004	L5	33	38,7836	21,215	27,5849	1,05553	8,87716	2,10194	2,5E-09	2,05E-09	0,047033	0,027382	0,002563	1,56E-08	0,007907	5,24E-09	