PARTIAL MELTING AND P-T EVOLUTION OF MIGMATITIC METAPELITES FROM THE SOUTHWESTERN GAGNON TERRANE, NORTHEASTERN GRENVILLE PROVINCE

SHERRI LYNN JORDAN

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A thesis submitted to the

School of Graduate Studies

in partial fulfillment of the

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Master of Science

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ABSTRACT

The Gagnon terrane (Parautochthonous belt, northeastern Grenville Province) is situated between the Grenville Front and the tectonically overlying High Pressure belt to the southeast. It was metamorphosed during the late stages of the Grenvillian orogeny (~1000 Ma) at *P-T* conditions increasing from greenschist facies near the Grenville Front to amphibolite and HP granulite facies farther south in the higher structural levels. Migmatitic metapelites from three thrust slices, which form part of the structurally higher levels, display evidence of extensive partial melting in the kyanite stability field and can be classified as HP granulites. These rocks are composed of variably intermixed leucosome and restite and have a peak assemblage of garnet + plagioclase + quartz + K-feldspar + kyanite ± biotite which is locally overgrown by retrograde biotite ± kyanite ± plagioclase ± quartz ± muscovite. The prograde sub-assemblage K-feldspar + kyanite is consistent with dehydration melting of micas. Textures as well as compositional patterns in garnet, in cases where growth zoning is preserved, are consistent with a reaction sequence involving: (a) dehydration melting of muscovite by the discontinuous NaKASH reaction: muscovite + quartz ± plagioclase = K-feldspar + kyanite + liquid [R1] followed by (b) dehydration melting of biotite by the continuous NaKFMASH reaction: biotite + quartz + kyanite ± plagioclase = K-feldspar + garnet + liquid [R2]. In one particular case, however, inclusion and zoning patterns in garnet are suggestive of dehydration melting of phengite instead of muscovite, followed by a discontinuous NaKFMASH reaction before entering the field of reaction [R2]. Muscovite has only been observed as

a replacement of kyanite or K-feldspar, suggesting that final crystallization of the melt took place in the muscovite stability field. Biotite is commonly developed at the expense of garnet, consistent with operation of reaction [R2] in the reverse sense, but it is not clear if all biotite is retrograde. Compositional data suggest that the metapelites crossed reaction [R1] at *P-T* conditions between 1140-1445 MPa and 750-780°C while the melt crystallized at conditions between 930-1100 MPa and 722-748°C. These data are consistent with a clockwise *P-T* path involving little decompression between the prograde and retrograde parts of the path. Migmatic metapelites also occur within a shear zone that marks the southern boundary of the upper structural levels in the southwestern Gagnon terrane, however, these rocks contain retrograde sillimanite (and K-feldspar) rather than kyanite. The presence of retrograde sillimanite suggests that final melt crystallization and possibly dehydration melting of micas by reactions [R1] and [R2] occurred at lower pressures at this locality.

In the lower structural levels located in the northeastern Gagnon terrane, the transition between muscovite-bearing metapelites to kyanite + K-feldspar-bearing migmatitic metapelites is marked by a zone in which leucosome locally occurs in muscovite-bearing rocks. Textures and garnet zoning in these mid-crustal levels are suggestive of the fluid-present melting reaction: muscovite + quartz + albite + H_2O = kyanite + liquid [3] that occurs at lower temperatures than [R1], followed by garnet growth by a divariant vapour-absent reaction of the type: biotite + kyanite + plagioclase + quartz = garnet + muscovite. Farther south, on the other side of the muscovite-out isograd, this reaction sequence was followed by reactions [R1] and [R2] with the former reaction being crossed at approximately 1525 MPa and 795°C . Thus, the main difference between kyanite + K-feldspar migmatitic metapelites from the higher and the mid-crustal levels is that in the former there is no evidence of fluid-present melting reactions predating dehydration melting of micas, whereas in the latter there is.

The metamorphic evolution of kyanite-bearing metapelites of the southern Gagnon terrane is consistent with previously proposed tectonic models involving NW-directed tectonic transport of the High Pressure belt over the Gagnon terrane, with incorporation of deeply buried rocks from the upper structural levels of the Gagnon terrane into the ductile shear zone near the interface with the HP belt. Thus the upper structural levels of the Gagnon terrane share metamorphic characteristics with both the tectonically overlying HP belt and the tectonically underlying remainder of the Gagnon terrane.

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ABBREVIATIONS

The following list of abbreviations follow the convention of Kretz (1983):

Ab = Albite	Alm = Almandine
An = Anorthite	Ap = Apatite
Bt = Biotite	Crd = Cordierite
Grt = Garnet	Grs = Grossular
Kfs = K-feldspar	Ky = Kyanite
Ms = Muscovite	Mnz = Monazite
Or = Orthoclase	Pl = Plagioclase
Prp = Pyrope	Qtz = Quartz
Rt = Rutile	Sil = Sillimanite
Sps = Spessartine	Tur = Tourmaline

The following are additional abbreviations used in this study:

As = Aluminosilicate	L = Liquid

CHAPTER 1: INTRODUCTION

1.1 PARTIAL MELTING OF PELITIC ROCKS IN THE KYANITE FIELD

Metamorphosed pelitic rocks undergo characteristic changes in mineralogy and texture when subjected to prograde metamorphism. Many aspects of the mineralogical changes in the greenschist and lower-mid amphibolite facies are now quite well understood in principle. For instance, projections in the AKFM tetrahedron (Thompson 1957) have rendered analyses of the common mineral assemblages and reactions under these conditions tractable, the application of Schreinemakers rules has added coherence and utility to *P-T* grids, and internally consistent thermodynamic data and solution models are available for most phases (e.g., Berman 1988). The principles of exchange and net transfer reactions are also well understood (e.g., Thompson 1976), and the stability ranges of most common assemblages are now reasonably well defined (Spear 1993; Philpotts 1990). In contrast, details of the changes in the upper-amphibolite and granulite facies, especially the partial melting (anatectic) reactions, are not as well understood. This thesis attempts to address this knowledge gap with a detailed study of metapelitic rocks from the Gagnon terrane of the NE Grenville Province.

Partial melting of quartzofeldspathic rocks in general can begin at temperatures as low as 600-680°C if they are in equilibrium with a H_2O-rich intergranular fluid phase. This type of melting, which is referred to as vapor-present or 'wet' melting, commonly occurs by the reaction: Qtz + Pl + Kfs + H_2O = L, in response to the intersection of the granite minimum melting curve with the geothermal gradient (mineral abbreviations are after Kretz 1983, see page xxvi). Vapor-absent or 'dry' melting, by the model reaction: Qtz + Pl + Kfs = L, occurs at considerably higher temperatures (McBirney 1993) and is probably restricted to the lower crust. Field evidence suggests that the amount of melt generated by the vapor-present reaction is generally small, and it has become apparent in recent years that the bulk of melting of pelitic rocks occurs by vapor-absent dehydration melting reactions involving micas (e.g., Qtz + Ms + Ab = Kfs + As + L and Qtz + Bt + As = Grt + Kfs + L) at upper amphibolite and granulite facies conditions (Phillips 1980; Waters and Whales 1984; Vernon and Collins 1988; Barbey et al. 1990), a process that can result in the production of significant amounts of granitoid magma.

Partial melting of metapelites occurs over a wide pressure range, although most data concerning phase relationships in the melt domain comes from experimental work and study of natural samples in the sillimanite stability field (low to medium pressure granulite facies) (e.g., Thompson and Tracy 1979; Thompson 1982; LeBreton and Thompson 1988; Vielzeuf and Holloway 1988). Studies of high-pressure granulite facies rocks are relatively rare, perhaps due to these rocks being traditionally considered scarce and tectonically insignificant (Bohlen 1987). However, this latter view has recently been disputed as a result of several investigations of uplifted high-pressure (HP) granulites (including HP metapelites) from continental collision belts such as the European Variscides (Vielzeuf and Pin 1989; Carswell and O'Brien 1993; O'Brien et al. 1997; Willner et al. 1997), the Grenville Province, SE Canadian Shield (Indares 1995; Indares et al. 1998) and the eastern Himalayas (Liu and Zhong 1997). Crustal rocks in these HP belts are commonly subjected to temperatures in excess of 800°C and pressures between 1500-2000 MPa, under which conditions metapelites should experience extensive dehydration melting of micas.

By comparison with studies of low-pressure metamorphic rocks, only a minor amount of work has been done to understand the melting processes in high-pressure granulite facies rocks. One study, which focused on kyanite-bearing migmatitic metapelites in the Manicouagan Imbricate Zone (MIZ), a HP crustal wedge located in the NE Grenville Province (Figure 1.1), documented for the first time textures consistent with melt crystallization following advanced dehydration melting of micas in the kyanite field (Indares and Dunning 2001). This study showed that such rocks may constitute an invaluable source of information on partial melting reactions in the deep crust of continental collision zones.

Migmatitic pelitic and semipelitic rocks were also discovered in the Gagnon terrane, which structurally underlies the MIZ in central Quebec (Figure 1.2). These rocks display evidence of vapor-present partial melting reactions in most of the NE Gagnon terrane (Rivers 1983; Indares 1995; Schwarz 1998) whereas preliminary studies (Indares and Rivers, unpublished) have suggested vapor-absent partial melting farther south, notably in the footwall of the MIZ (SW Gagnon terrane).

1.2 AIM OF STUDY

The aim of this study is to elucidate the partial melting reactions and the *P-T* evolution of migmatitic metapelites in key localities from the footwall of the MIZ in the

SW Gagnon terrane. The approach used includes: (a) a detailed petrographic study of typical samples, (b) interpretation of textures and chemical zoning of minerals in terms of melting and crystallization reactions and *P-T* paths, and (c) determination of *P-T* conditions using published petrogenetic grids and thermobarometry. In addition, a complementary investigation was performed on kyanite-bearing migmatitic metapelites from other locations in the Gagnon terrane. The results of this thesis will further constrain the metamorphic evolution of formerly deep crustal segments in the NE Grenville Province and provide new data to further understanding of partial melting of pelitic rocks under HP conditions.

1.3 GEOLOGICAL CONTEXT: THE GRENVILLE PROVINCE

The Grenville orogen extends from Mexico through eastern North America to Scandinavia (Hoffman 1988) and is exposed for a length of approximately 2000 km in the SE Canadian Shield as the Grenville Province (Figure 1.1). The NW part of the orogen in Canada is largely comprised of reworked Archean and Paleoproterozic rocks derived from pre-Grenvillian Laurentia, whereas, farther SE, Mesoproterozic rocks emplaced into or accreted onto Laurentia become more abundant (Rivers et al. 1989, 1993; Corrigan et al. 1994; Rivers 1997). The Grenville orogen is the result of a continental collision (Dewey and Burke 1973) between Laurentia and an unknown continent (possibly South America; Moores 1991; Dalziel 1991, 1994; Hoffman 1991; Wasteneys et al. 1995) between ~1190 - 980 Ma (Rivers 1997), an interval defined as the Grenvillian orogeny. This orogeny involved at least three pulses of NW-directed, crustal-scale thrusting, crustal thickening and associated metamorphism with the Shawinigan (~1190-1140 Ma) and Ottawan (~1080-1060 Ma) pulses being focused in the hinterland of the exposed orogen and the latest pulse (Rigolet, ca. 1010-990 Ma) being focused closer to the Grenville Front (Rivers 1997). The Grenville Front is a NE-trending high strain thrust boundary representing the NW limit of the Grenville Province (Rivers et al. 1989), that separates the Archean and Proterozoic foreland NW of the orogen from the reworked hinterland to the SE (Figure 1.1) (Rivers et al. 1989).

Extensive geological, geophysical and geochronological studies in the Grenville Province have resulted in the identification of distinct NE-trending belts based on their Grenvillian tectonometamorphic signatures (Rivers et al. 1989; Ludden and Hynes 2000, Rivers et al. 2002). The Parautochthonous belt is the lowest structural unit in the Grenville Province and it represents the tectonically reworked rocks of the adjacent foreland. Part of the Parautochthonous belt displays a structurally telescoped Barrovian metamorphic gradient (Rivers et al. 1993) which developed during the final propagation of the orogen towards the foreland (Rigolet pulse ~1005-995 Ma; e.g., Krogh 1994).

The Parautochthonous belt is structurally overlain by far-traveled units which display evidence for a strongly contrasting Grenvillian metamorphic signature to that in the underlying rocks, and are collectively referred to as the Allochthonous belt (Rivers et al. 1989). Grenvillian metamorphic conditions recorded in the Allochthonous belt range from a weak overprint to low/medium P-HT and HP-HT conditions. This led to a new division of the Allochthonous belt into a Low Pressure (LP) and a High Pressure (HP) belt (Ludden and Hynes 2000; Rivers et al. 2002). The latter structurally overlies the Parautochthonous belt to the south and consists of a series of crustal wedges containing HP-granulite and eclogite facies rocks. These rocks are interpreted to have been deeply buried during the Ottawan pulse of the Grenvillian orogeny before being rapidly exhumed by alternating episodes of compression and extension during a foreland-ward propagation of the orogen (Hynes et al. 2000; Indares et al. 2000; Rivers et al. 2002). The Parautochthonous and Allochthonous belts have been further subdivided into terranes with distinct lithotectonic characteristics (Rivers et al. 1989).

1.4 THE GAGNON TERRANE

1.4.1 Lithotectonic Framework of the NE Grenville Province

The Gagnon terrane, which is the focus of this study (Figure 1.2), is the main parautochthonous unit in the study area. It consists of Paleoproterozoic lithologic units that continue to the north of the Grenville Province into the Paleoproterozoic New Quebec orogen, and their Archean basement, both of which were reworked in the Rigolet pulse of the Grenvillian orogeny. The Gagnon terrane is bounded by the Grenville Front in the north, whereas in the south it is tectonically overlain by allochthonous units of the HP belt, namely the MIZ and the Molson Lake terrane (MLT) (Figure 1.2). Further south, allochthonous units of the LP belt include the Lac Joseph, Hart Jaune and Berthé terranes (Figure 1.2). The allochthonous terranes south of the Gagnon terrane are mainly composed of Paleoproterozoic and Mesoproterozoic igneous rocks. Metamorphic conditions in the MLT and MIZ reached 1400-1800 MPa and 800-950°C at 1050 Ma, i.e., during the Ottawan pulse of the Grenvillian orogeny (Indares and Rivers 1995; Indares et al. 2000; Rivers et al. 2002), whereas, the overlying terranes further south record medium pressure granulite facies conditions of 700-900 MPa and 700-800°C (e.g., Berthé terrane, Hynes et al. 2000) or negligible Grenvillian metamorphism (e.g., Lac Joseph terrane, Connelly et al.1995).

1.4.2 Geology of the Gagnon Terrane

Lithologic units in the Gagnon terrane include a variably reworked Paleoproterozic continental margin sequence, correlated with the Knob Lake Group of the Labrador Trough sequence (Rivers 1983a), and its underlying Archean basement (Rivers et al. 1993), which is correlated with the Ashuanipi Complex of the adjacent Superior Province. The Knob Lake Group, part of the Kaniapiskau Supergroup (Rivers 1980), includes a sequence of greywacke/shale, dolostone, quartzite, and iron formation that are recognizable in the Gagnon terrane as meta-semipelite/metapelite, quartzofeldpathic gneiss, dolomitic marble, quartzite, and iron formation (Rivers 1980, 1983a). The Archean basement is characterized by reworked granoblastic quartzofeldspathic gneiss, and amphibolite (Clarke 1977).

The rocks of the Gagnon terrane are deformed into a NW-verging, metamorphic fold-thrust belt (Rivers 1983b; Rivers et al. 1993) with metamorphic grade increasing from greenschist at the Grenville Front to HP amphibolite and locally HP granulite and eclogite facies in the higher structural levels in southern part of the terrane (Rivers 1983a; van Gool 1992; Indares 1993, 1995, 1997; Rivers et al. 1993). Metamorphism in the Gagnon terrane is attributed to the Rigolet pulse of the Grenvillian orogeny (Rivers 1997).

1.4.3 Tectonic Models

The tectonic evolution of the NE Grenville Province during the Grenvillian orogeny involves tectonic emplacement of deep crustal rocks (HP belt) over the foreland (parautochtonous rocks), and subsequent development of a mid-crustal fold-and-thrust belt defined as the Gagnon terrane. Some studies have suggested that following crustal thickening in the interior of the orogen, the rocks of the Molson Lake terrane were tectonically uplifted as a crustal-scale thrust wedge over the southeastern Gagnon terrane along a crustal-scale ramp, followed by progression onto a footwall flat (van Gool 1992; Rivers et al. 1993). A comparable model, involving thermal weakening of thick crust by upwelling of asthenospheric material and extrusion aided by NW-directed transport over a crustal scale ramp (Archean basement of the Gagnon terrane) was proposed for the emplacement of the MIZ over the Gagnon terrane (Indares et al. 1998, 2000). In either scenario, NW propagation of the HP units resulted in crustal thickening and the development of a NW-verging, fold-thrust belt (Gagnon terrane) as a result of accretion of supracrustal and basement rocks to the base of the wedge at approximately 1000 Ma (Rigolet Pulse). Recent tectonic models have suggested that HP rocks from the upper structural levels in the southern Gagnon terrane were also deeply buried before they became incorporated into the ductile shear zone at the interface of the HP belt and later thrust over the more northerly parts of the Gagnon terrane along a crustal scale ramp

(Indares 1995).

1.5 METAMORPHIC GRADIENTS IN THE GAGNON TERRANE

Studies of the lower structural levels in the NE Gagnon terrane (Figure 1.2) have revealed a structurally telescoped Barrovian metamorphic signature (Rivers 1983a, 1983b, 1997; van Gool 1992; Rivers et al. 1993) with six metamorphic zones of increasing grade being identified from the Grenville Front towards the higher structural levels in the SE (Figure 1.3): (1) muscovite + chlorite, (2) muscovite + chlorite + biotite, (3) muscovite + chlorite + garnet + biotite, (4) muscovite + staurolite + kyanite + biotite, (5) muscovite + kyanite + garnet + biotite, and (6a) granitic veins. Zones 1-5 involve metapelitic rocks while the granitic veins of zone 6a were found associated with meta-semipelitic rocks. A similar zone 6, referred to in this study as zone 6b, was recognized in the Sandy Lake Synform (Indares 1995) and in most of the area studied by Schwarz (1998) in the SE Gagnon terrane (Figure 1.2). This zone is characterized by the assemblage muscovite + kyanite + garnet + granitic veins and is found in pelitic rock. A seventh zone characterized by kyanite + K-feldspar ± biotite granitic pods and veins was identified further south in metapelite of the Lac Carheil Synform (Lac Opocopa area, Indares 1995) and the Lac Gull thrust slice (Lac Audréa area, Schwarz 1998) (Figure 1.2).

The presence of granitic material in zones 6 and 7 indicate that these zones experienced partial melting with the granitic veins representing leucosome, or crystallized melt, and the portion of the rock that did not melt being referred to as the restite. While leucosome of the entire zone 6 is interpreted to have formed by vapor-present reactions, those associated with meta-semipelite of zone 6a are attributed to the reaction: Qtz + Pl + Kfs + H_2O = L (Rivers 1983a; van Gool 1992) while those associated with metapelite of zone 6b probably melted by a reaction such as Ms + Ab + Qtz + H_2O = Ky + L (Indares 1995). Leucosome associated with metapelite of zone 7 is more abundant and together with the absence of muscovite and presence of K-feldspar and kyanite indicate dehydration melting of micas (Indares 1995).

Extensively migmatized metapelites with assemblages typical of zone 7 were also identified in the higher structural levels of the SW Gagnon terrane in the footwall of the MIZ (Figure 1.2). The continuity of isograds separating the metamorphic zones across the Gagnon terrane is unknown, however, owing to the lack of information over large areas in the central part of the terrane.

1.6 SAMPLE LOCATIONS

This thesis did not involve field work by the author. The migmatitic metapelites of the SW Gagnon terrane, the main subject of this study, occur in three synforms of Knob Lake Group rocks, structurally folded and/or faulted into the Archean basement (Figure 1.2). In addition, sillimanite + K-feldspar + garnet + biotite bearing metapelites occur farther south in a shear zone (area 4, Figure 1.2) that likely represents the southern boundary of the Gagnon terrane (Indares, personal communication). Samples from these areas were collected along the shore of the Manicouagan Reservoir (Figure 1.2) by Dr. Aphrodite Indares and were examined for the first time within the context of this study.

The amount of leucosome present in these metapelites is variable with slices #1 and #2 containing 15-20% leucosome (Plate 1.1), while those in slice #3 contain 20-30% leucosome (Plate 1.2) (Indares, personal communication). The proportion of leucosome present in the shear zone (Plate 1.3) is difficult to determine since the area is composed of alternating layers, dominated by restite and leucosome, due to shearing.

The study of metapelites from the SW Gagnon terrane is complemented by the study of key samples from the SE Gagnon terrane which were selected from the Schwarz (1998) and Indares (1995) collections and were re-examined in terms of partial melting history. While the percentage of leucosome present at the outcrop scale in the metapelite of the Lac Gull thrust slice in the Lac Audréa area was not indicated by Schwarz (1998), metapelite from the Lac Opocopa area (Indares 1995) generally contains less than 5% leucosome (Indares, personal communication). The samples for this study were chosen to examine the variation in melt reactions across a wide area of the Gagnon terrane.

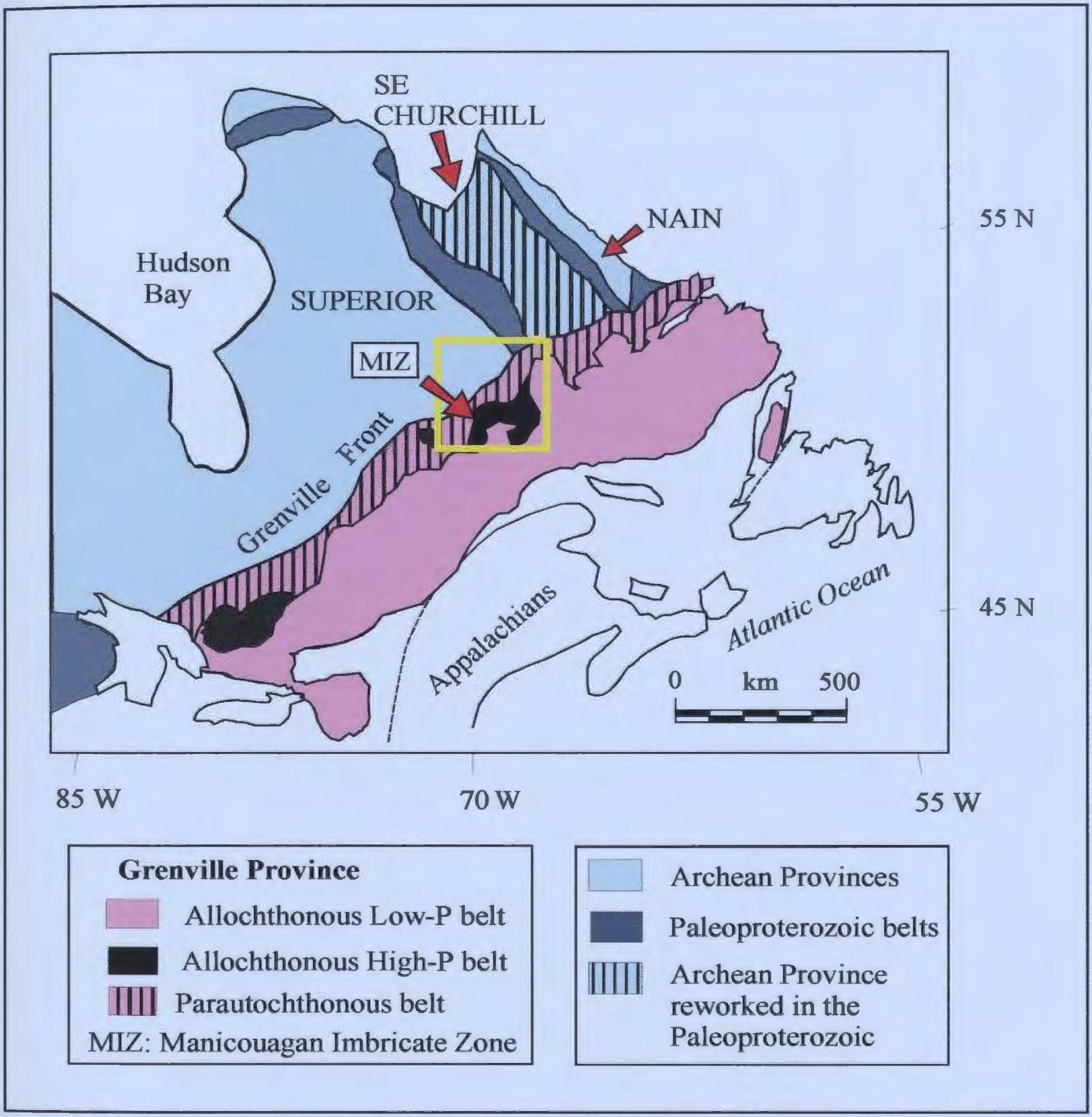
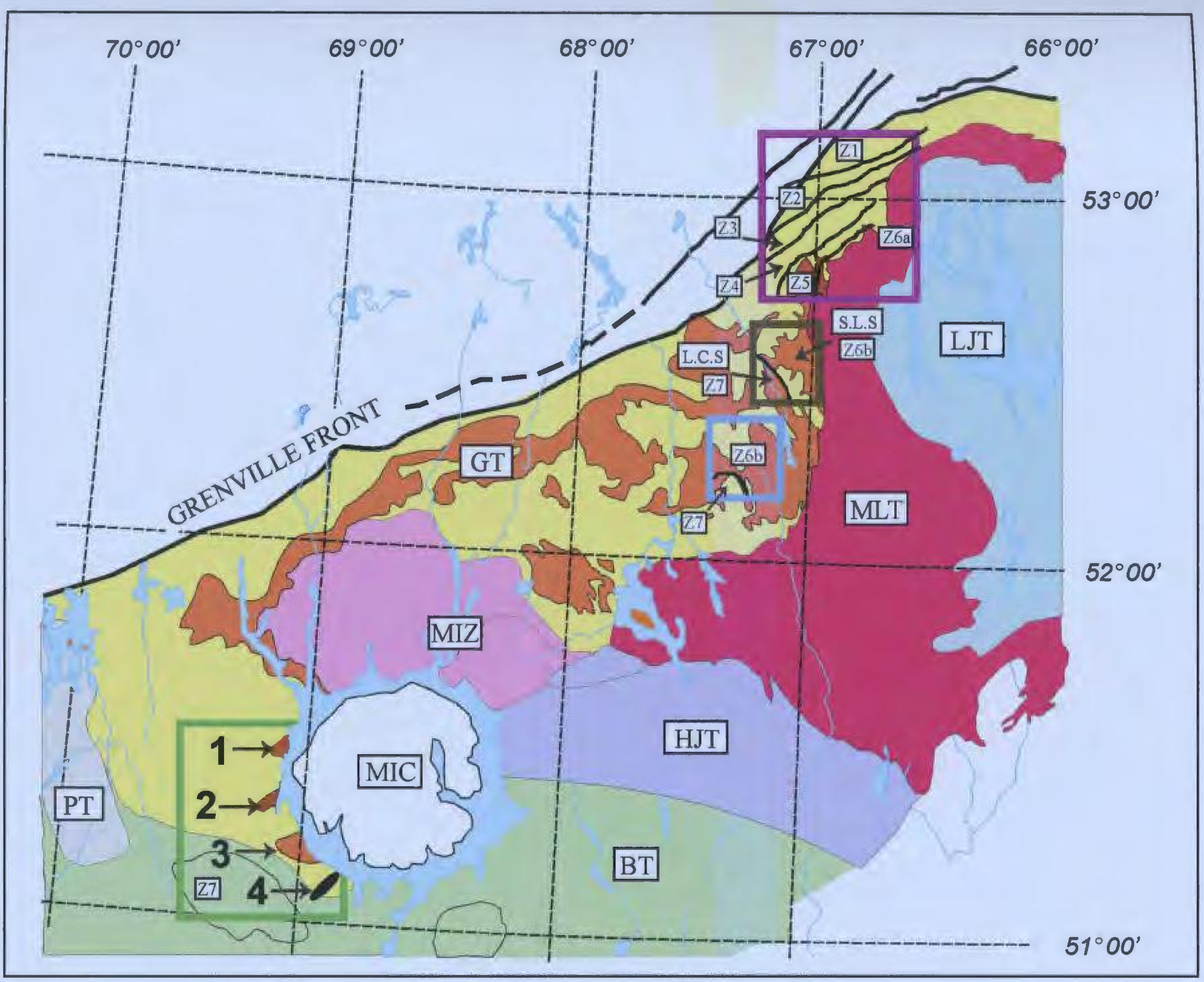


Figure 1.1: Simplified map of the eastern Canadian Shield showing the Grenville Province (after Rivers et al. 1989; Rivers et al. 2002). Area outlined in yellow shows the location of Figure 1.2.


70° 00'
69° 00'
68° 00'
67° 00'
66° 00'
53° 00'
52° 00'
51° 00'
GRENVILLE FRONT
Z1
Z2
Z3
Z4
Z5
Z6a
S.L.S
Z6b
L.C.S
Z7
LJT
GT
Z6b
Z7
MLT
MIZ
HJT
MIC
PT
BT
1
2
3
4
Z7

Allochthonous Low-P Belt

LJT Lac Joseph terrane

BT Berthé terrane

HJT Hart Jaune terrane

PT Pambrun terrane

Allochthonous High-P Belt

MIZ Manicouagan Imbricate zone

MLT Molson Lake terrane

MIC Manicouagan Impact Crater (Triassic)

Parautochthonous Belt

Gagnon terrane

GT Upper Kaniapiskau Supergroup

GT Lower Kaniapiskau Supergroup and reworked Archean basement

Current study area

Study area of van Gool 1992

Lac Audréa area (Studied by Schwarz 1998)

Lac Opocopa area (Studied by Indares 1995)

L.C.S: Lac Carheil synform

S.L.S: Sandy Lake synform

Figure 1.2: Simplified geological map of a portion of the eastern Grenville Province. The study area focuses on thrust sheets containing migmatitic metapelites which are present in the SW Gagnon terrane. Thrust slices numbered 1-3 are kyanite-bearing, whereas area 4 represents a sillimanite-bearing shear zone. Metamorphic zones as discussed by Rivers (1983a), and van Gool (1992), are numbered Z1-Z7 (see section 1.5).

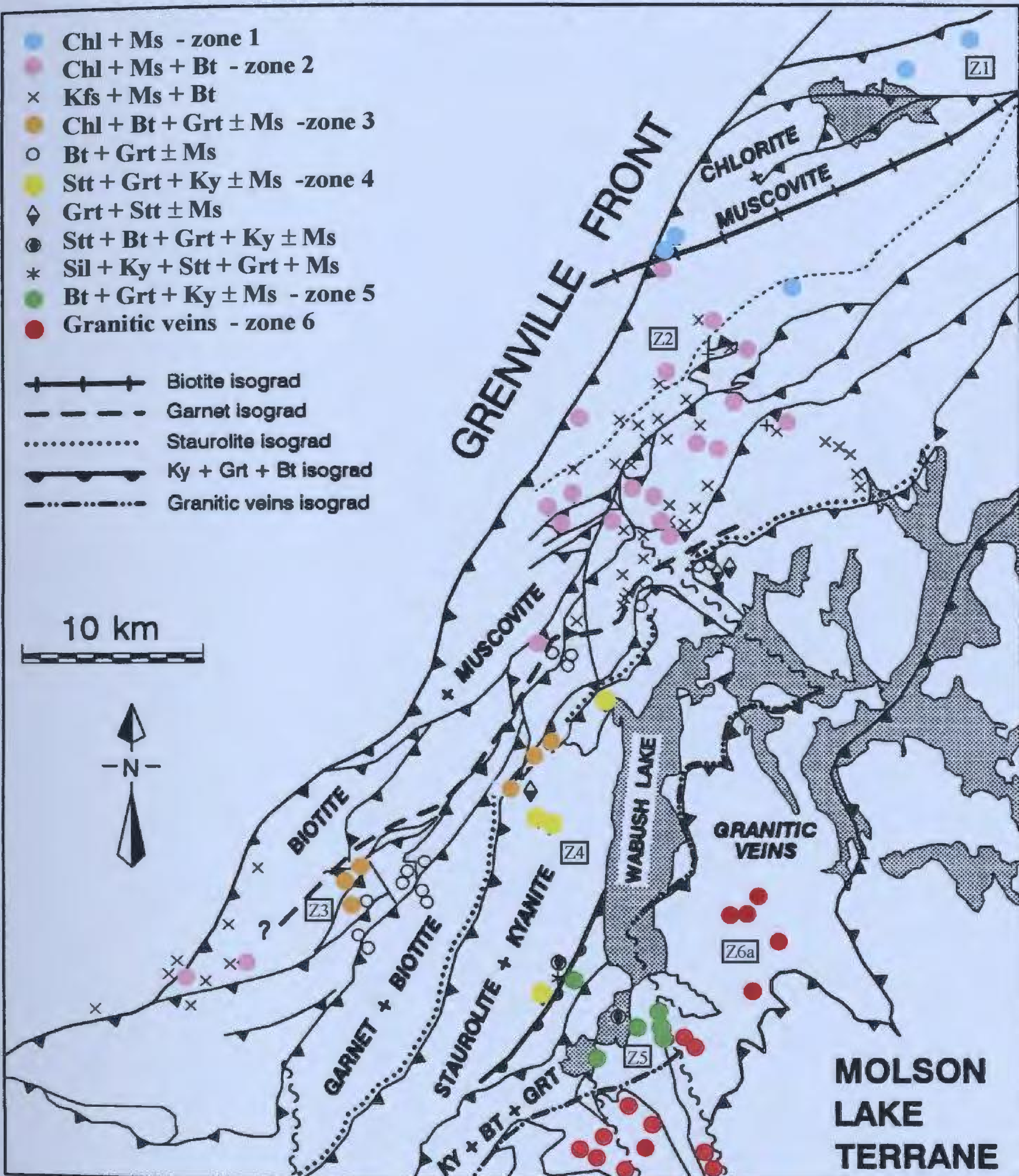


Figure 1.3: Map of metamorphic zoning in the northern Gagnon terrane based on mineral assemblages in metapelitic and meta-semipelitic rocks. Data from Rivers 1983b and van Gool 1992 (Figure modified after van Gool 1992).

Plate 1.1: Migmatitic metapelite from thrust slice #2. Note the use of the camera lens cover for scale.

Plate 1.2: Migmatitic metapelite from thrust slice #3. Note the use of the camera lens cover for scale.

Plate 1.3: Migmatitic metapelite from the shear zone (area #4).

CHAPTER 2: THEORETICAL BACKGROUND: PARTIAL MELTING OF PELITIC ROCKS

2.1 THE ROLE OF H_2O IN PARTIAL MELTING

During prograde metamorphism, pelitic rocks experience partial melting at upper amphibolite- to granulite-facies conditions when they are buried and heated sufficiently for melting to occur. The conditions for melting can be predicted by melting reactions, and these reactions modeled in *P-T* space. In general terms, the conditions for the initiation of melting depend on the presence or absence of a hydrous vapor phase, owing to the capacity of melts to dissolve H_2O. In the simplified case of K-feldspar-bearing quartzofeldspathic rocks containing only anhydrous phases, this can be illustrated by the *P-T* diagrams of Figures 2.1 and 2.2 which are valid for melting in granitic systems. In these diagrams, the vapor-present ("wet" or water-saturated) and vapor-absent ("dry") melting curves have opposite slopes in *P-T* space and are separated by an increasingly larger temperature interval with increased pressure. The role of H_2O in melting has been modeled both as a function of the percentage of H_2O dissolved in the melt (Figure 2.1) and as a function of the activity of H_2O in the fluid phase (Figure 2.2).

The difference in slope of the wet and dry melting curves can be explained by the Clapeyron equation as follows:

$$\frac{dT}{dP} = \frac{T\Delta V}{\Delta H}$$

with T representing temperature, dT and dP being the rate of change of temperature and pressure, and ΔV and ΔH indicating the change in volume and enthalpy of the reaction respectively. The slope of the dry melting curve is positive because the volume of the liquid produced is greater than the volume of the solid reactants (i.e., ΔV of melting is positive) and melting reactions are endothermic (ΔH is positive), hence, temperature of melting increases with increasing pressure. On the other hand, the slope of the wet melting curve is negative because the volume of the reactants (solids plus water vapor) is greater than the volume of the melt produced (ΔV of melting is negative). As a result, the temperature of melting will decrease with increasing pressure in this case. In addition, the slope of the wet melting curve is progressively less negative with increasing pressure, because the volume of the vapor phase decreases with increasing pressure. It can also be seen from Figure 2.1 that, for a given temperature, the amount of H_2O that can exist dissolved in the melt increases with pressure, and from Figure 2.2 that reduction in the activity of H_2O in the fluid phase increases the temperature of melting. It should be noted that Figure 2.1 shows a simplified static version of a geothermal gradient which does not take into account the dynamic changes that are likely to result from thermal relaxation in active orogenic environments, or tectonic events (e.g., thrusting or normal faulting).

The melting of pelitic and semipelitic rocks is more complex than melting in the granitic system because they typically contain hydrous phases such as biotite and, in the case of pelitic rocks, muscovite instead of K-feldspar. Breakdown of micas at high temperatures releases H_2O and thus may contribute to melt production (Burnham 1967; Lambert et al. 1969; Brown and Fyfe 1970). These reactions are known as dehydration melting reactions (Thompson 1982) and occur at intermediate temperature conditions between those of the wet and dry melting curves.

2.2 VAPOR-PRESENT VERSUS VAPOR-ABSENT MELTING

In order to produce S-type granitic magma (Chappell and White 1974) from the partial melting of metapelites, a significant supply of H_2O has to be available. The question therefore arises as to what is the source of the H_2O? Is there enough H_2O present along grain boundaries to produce the granite magma by vapor-present melting, or does it come from some other source? (e.g., dehydration melting of micas).

Several arguments have been proposed against vapor-present melting being the dominant melting process of metapelites. Firstly, vapor-present partial melting is inconsistent with the development of high-grade mineral assemblages in the residuum because the rocks would melt before the formation of these assemblages (Spear et. al 1999). Secondly, deep crustal rocks are not likely to contain significant porosity and hence free H_2O at the sites where melting may take place. It has been argued that the limited amount of H_2O in pores or along grain boundaries would only form a small amount of melt at the vapor-saturated solidus (Spear et. al 1999). It is therefore concluded that significant melting cannot take place at deep crustal levels if the only supply of H_2O is that which is present along grain boundaries.

2.2.1 Vapor-Present Granite Minimum Melting

Granite minimum melting (Luth 1976) refers to the lowest temperature, vapor-present melting that may occur in quartz + K-feldspar + plagioclase bearing rocks such as semipelites. At approximately 600-650°C (Huang and Wyllie 1975; Thompson and Algor 1977), melting of quartz and feldspar (Kfs + Pl + Qtz + H_2O = L) begins at the vapor-saturated solidus (Figure 2.1, 2.2) (Burnham 1967, 1979; Thompson 1982; Clemens and Vielzeuf 1987) resulting in the production of granitic melt containing an amount of dissolved H_2O that depends on pressure (Spear et al. 1999). In general, only a small amount of saturated melt, proportional to the amount of H_2O available along grain boundaries (Le Breton and Thompson 1988) and the lithostatic pressure, is expected to be formed at the H_2O saturated solidus, with limited H_2O availability being the most common limiting factor inhibiting progress of the melt reaction.

2.2.2 Dehydration Melting

Under vapor-absent conditions, metapelitic rocks will experience melting at higher temperatures by reactions involving muscovite and biotite as reactants instead of K-feldspar. Dehydration of the mica provides the H_2O which is needed for significant melting of metapelites, resulting in the formation of undersaturated S-type granitic melts and depleted granulites as residuum (Burnham 1967; Thompson 1982; England and Thompson 1984; Patiño-Douce and Johnston 1991). Dehydration melting of metapelite is typically a two stage process involving muscovite at lower temperatures (< 700°C at 4-10 kbar, Thompson and Algor 1977; 725°C at 10 kbar, Storre 1972) followed by biotite at higher temperatures (760-800°C at 10 kbar, Le Breton and Thompson 1988; 850-870°C at 5 kbar, 900-915°C at 10 kbar, Carrington and Harley 1995).

2.3 REPRESENTATION OF MELTING REACTIONS IN *P-T* SPACE

The position of the various melting reactions in pelitic systems have been constrained in *P-T* space by numerous experimental studies, at pressures up to 12 kbar, (Huang and Wyllie 1973, 1974, 1975, 1981; Huang et al. 1973; Bohlen et al. 1983; Clemens 1984; Le Breton and Thompson 1988; Patiño Douce and Johnson 1991; Vielzeuf and Clemens 1992; Vielzeuf and Montel 1994; Gardien et al. 1995), and by using Schreinemakers rules (Zen 1966) that allow determination of the relative positions of reactions in *P-T* space for a given system. Petrogenetic grids have been proposed for vapor-present and -absent melting (Thompson and Algor 1977; Thompson and Tracy 1979; Thompson 1982; Grant 1985a, b; Vielzeuf and Holloway 1988; Powell and Downes 1990; Carrington and Harley 1995; Thompson and Connolly 1995; Spear et al. 1999).

2.3.1 Variance of Melting Reactions

Many of the early works treated melting reactions as univariant lines in *P-T* space which intersect to define invariant points (e.g., Vielzeuf 1983). This representation is valid for simple systems such as KASH, KFASH and KMASH that contain pure phases such as quartz and orthoclase. However, it does not account for solid solutions (e.g., Ca-Na plagioclase, and ferromagnesian phases). Natural pelitic rocks are more accurately described by complex systems such as KFMASH, NaKFMASH and CaNaKFMASH. In these systems, divariant reactions are of major importance, and should ideally be portrayed by pseudosections (Hensen 1971), which are drawn for a particular bulk composition. Pseudosections display both the univariant discontinuous reactions and the divariant continuous reactions which act on that particular composition.

2.3.2 Development of Complex Petrogenetic Grids

In order to comprehend complex petrogenetic grids such as those for the CaNaKFMASH system, it is best to begin with phase relationships in the simple KASH system (Figure 2.3).

2.3.2.1 KASH system

In the KASH system (Lambert et al. 1969; Thompson and Algor 1977) five reactions involving muscovite, quartz, aluminum-silicate (As), K-feldspar, H_2O and liquid (L), if we assume excess quartz, may be written (Figure 2.3):

Ms + Qtz = As + Kfs + H_2O	[1] = [L]
Ms + Qtz = As + Kfs + L	[2] = [H_2O]
Ms + Qtz + H_2O = As + L	[3] = [Kfs]
Kfs + As + Qtz + H_2O = L	[4] = [Ms]
Ms +Kfs + Qtz + H_2O = L	[5] = [As]

These reactions are labelled both numerically, after Spear et al. (1999), and according to the absent phase notation.

For a_{H2O}=1, all reactions intersect at approximately 730° and 6.1 kbar (Spear et al. 1999) to define an invariant point [IP1] (Figure 2.3). The vapor-present melting reactions are the first to occur at pressures above the invariant point, and they involve both anhydrous (Qtz, Kfs) and hydrous (Ms) phases (reactions [5] and [3]) (after Huang and Wyllie 1974). Reaction [5] involves both muscovite and K-feldspar and occurs in aluminosilicate-absent compositions that correspond to semipelites rather than pelites. Thus the minimum melting reaction for pelitic rocks is commonly reaction [3]. At pressures less than the invariant point, muscovite is eliminated in the solidus region by reaction [1] and melting starts at higher temperatures by reaction [4]. Only a small amount of melt is expected to form by these reactions owing to limited amount of H_2O vapor present at deep crustal levels as discussed above. Therefore, significant melt in this system can only be produced at pressures above the invariant point by the muscovite dehydration melting reaction [2] (Le Breton and Thompson 1988). Note that in typical pelitic rocks, K-feldspar is formed at the expense of muscovite during melting as a result of reaction [2], and the two minerals do not coexist in the divariant fields.

2.3.2.2 KFMASH system

The KFMASH system builds upon the reactions already determined in the KASH system, with the addition of FeO and MgO allowing the consideration of additional minerals such as garnet, biotite, cordierite, orthopyroxene and spinel. The large number of possible phases in this system means that it has several potential univariant points (each one with c+2 phases) from which radiate univariant lines that bound divariant fields forming a complex network (Grant 1985). However, not all of these univariant points and reactions are of relevance to natural rocks, and relatively simpler grids are available, especially for vapor-absent systems with excess quartz (Figure 2.4) (Spear et al. 1999).

In pelitic rocks, the assumption of excess quartz is justified because they usually contain large amounts of quartz. However, because this phase is a reactant in all melting reactions, occasionally it is eliminated at high temperatures (above ~ 900°C) and in this case alternate grids for quartz-absent systems have to be used. The assumption of a vapor-absent system appears also to be valid because partial melting involving ferromagnesian phases occurs at higher temperatures than that involving muscovite, and will therefore likely occur after complete elimination of vapor by reaction [3].

Figure 2.4, which is based on the Spear et al. (1999) grid of the KMASH system, shows three invariant points, in addition to IP1 from the KASH system (now labelled IP1', the prime denoting invariant points in the KFMASH system) each one with eight phases:

IP2' - Bt As Grt Crd H_2O Kfs Qtz L [Opx]

IP3' - Qtz Kfs Bt Grt Opx Crd H_2O L [As]

IP4' - Bt Grt Opx Crd As Qtz Kfs L [H_2O]

IP4' has been located experimentally by Carrington and Harley (1995) at approximately 900°C and 8.8 kbar.

2.3.2.3 Biotite dehydration melting

The main advantage of the KFMASH system relative to the simpler systems is that it allows the portrayal of dehydration melting of biotite. In addition to the univariant reactions shown in Figure 2.4, biotite also participates in continuous partial melting reactions that occur in divariant fields and are not explicitly labeled in the figure. For instance, in medium-pressure and high-pressure metapelites, biotite starts melting on the high temperature side of the discontinuous KASH reaction [2]: Ms + Qtz = As + Kfs + L according to the continuous KFMASH reaction: Bt + As + Qtz = Grt + Kfs + L (shaded area in Figure 2.4; Le Breton and Thompson 1988; Vielzeuf and Holloway 1988; Patiño Douce and Johnson 1991; Gardien et al. 1995). This reaction is bounded on the high temperature side by the univariant reaction: Bt + Grt + Qtz = Opx + As + Kfs + L (Carrington and Harley 1995), that also consumes biotite and is responsible for the first appearance of orthopyroxene at this pressure range.

The temperature interval of biotite melting by the continuous reaction described above depends on the X_{Mg} of the source rock, the concentration of other elements in biotite (e.g., Al, Ti in octahedral sites, F, Cl in hydroxyl sites and Na in the alkali sites) and the pressure at which melting occurs. The width of the divariant band is inversely proportional to bulk X_{Mg} at a given pressure (Carrington and Harley 1995). For instance, in typical low X_{Mg} pelitic rocks, biotite is eliminated by the continuous reaction, and therefore, the orthopyroxene-in reaction does not occur (Carrington and Harley 1995). Therefore, to interpret partial melting of pelitic rocks it is important to take bulk composition into account. In addition, the biotite-out temperature can be increased by the concentration of 'stabilizing' elements in the biotite such as titanium (Forbes and Flower 1974) and fluorine (Manning and Pichavant 1983), which become increasingly concentrated in the biotite as melting progresses (Le Breton and Thompson 1988).

The role of K-feldspar in the biotite-melting reactions has also been debated. It has been suggested that K-feldspar may actually be either a product or a reactant depending on the H_2O / K ratio of melt (Carrington and Watt 1995), whereas another study indicated that the appearance of K-feldspar as a product depends on the proportion of biotite in the starting rock composition (Vielzeuf & Holloway 1988). The amount of K-feldspar produced by the melting reactions is expected to increase with pressure (Castro et al. 1999) because high pressure melts can hold more H_2O in solution (see section 2.1) leading to a lesser production of melt for a given amount of available H_2O (Holtz and Johannes 1994).

2.3.2.4 NaKFMASH and CaNaKFMASH systems

The addition of Na to the KFMASH system does not change the variance of the system because it also adds one phase (albite) (Spear et al. 1999). Including Na in the system does, however, cause the invariant points to shift to lower temperatures and pressures (Figure 2.5) because Na is preferentially incorporated in the melt (Thompson and Tracy 1979) and albite is a reactant in all the dehydration melting reactions. In the presence of albite, the temperatures of melting reactions are lowered by 40-60°C (for example, Luth 1976; Johannes and Holtz 1990). As a consequence of this, the invariant points also shift, with IP1', for example, being displaced dramatically from 725°C and 6 kbars in the KFMASH system to approximately 650°C and 3.8 kbar (Huang and Wyllie 1975).

In pelitic rocks, Ca occurs in low concentrations and is dominantly incorporated in plagioclase (anorthite) and garnet (grossular) (Patiño Douce and Johnston 1991; Johannes and Holtz 1992). Unlike the addition of Na to the KFMASH system, the addition of Ca to the NaKFMASH system changes the variance because no new phase is added (Spear et al. 1999). Ca partitions into both plagioclase and garnet more readily than into the melt, thereby shifting the locations of the melting reactions to higher temperatures relative to the NaKFMASH system (Winkler 1976; Wyllie 1977; Spear et al. 1999). However, since typical pelites are low in Ca (plagioclase composition is commonly An 20-30), their partial melting temperatures do not differ significantly from those in the NaFKMASH system. For the same reason, reactions that are divariant owing to Na-Ca substitution in plagioclase occur in a very narrow temperature interval and can be portrayed as univariant for the sake of simplicity (Carrington and Harley 1995; Spear et al.1999).

2.3.2.5 Melting reactions involving phengite

It was shown that in the NaKFMASH system, the univariant muscovite-out reaction Ms + Ab + Qtz = Ky + Kfs + L acts as a low-temperature boundary to the continuous melting reaction of biotite (Figure 2.5). This is shown as reaction [R1] in Figure 2.6. However, at high metamorphic pressures, a white mica with limited Fe-Mg substitution (phengite) is more stable than muscovite, and dehydration melting of phengite has to be taken into account. Because phengite contains Fe and Mg, its dehydration melting can be expressed by a 'continuous version' of the muscovite-out reaction in the NaKFMASH system: Phe + Ab + Qtz = Bt + Ky + Kfs + L (reaction [R1a] versus [R1] in Figure 2.6).

Reaction [R1a] has been previously considered by Thompson (1982) in the KFASH system where divariant KFMASH reactions are reduced to univariant. Therefore, in this system reactions [R1a] and the biotite dehydration melting reaction: Bt + Qtz + Ky + Ab = Kfs + Grt + L (reaction [R2] in Figure 2.6) intersect in *P-T* space at an invariant point. At pressures above this invariant point, a different set of phengite and biotite melting reactions can be written with biotite being eliminated before phengite. This change in the melting sequence of micas has been discussed by Vielzeuf and Holloway (1988) and Le Breton and Thompson (1988), who also noted that the biotite reaction has a steeper slope than the white mica-out reaction. However, these authors did not describe the case adequately because, although they were working on the NaKFMASH system where both reactions are divariant, they treated them as univariant.

Intersection of two divariant reactions in the same system defines a new univariant reaction whose length depends upon bulk composition (Hensen 1971; Powell and Downes 1990; Carrington and Harley 1995). In the present case, the divariant reactions [R1a] and [R2] intersect to give the univariant reaction [R_{II}] which has been written as: Grt + Phe + Ab + Qtz = Bt + Ky + Kfs + L (Figure 2.6) (Indares and Dunning 2001). Note that reaction [R2] is the same as the continuous biotite melting reaction shown in pink in Figure 2.5. At temperatures above the intersection, phengite and biotite melt simultaneously by the reaction [R3]: Bt + Phe + Ab + Qtz = Grt + Kfs + L, (Thompson 1982; Le Breton and Thompson 1988; Indares and Dunning 2001) followed at higher temperatures by dehydration melting of excess phengite by the garnet forming reaction [R4]: Phe + Ab + Qtz = Grt + Ky + Kfs + L. The positions of reactions [R3] and [R4] are schematic in Figure 2.6 and are only constrained by Schreinemaker's rules due to the lack of high pressure melting experiments involving phengite. However, this figure shows that phengite-bearing metapelites follow a more complex partial melting history then muscovite-bearing rocks, especially at high pressures. The muscovite-out reaction (reaction [R1] in Figure 2.6) is also indicated, to point out that its *P-T* location is close to that of reaction [R1a] (Vielzeuf and Holloway 1988). Also, since phengite has limited Fe-Mg substitution, the width of reaction [R1a] is expected to be fairly narrow.

2.4 TOOLS FOR DETERMINING REACTION HISTORY

Sequences of partial melting reactions experienced by typical metapelites with increasing temperatures, and the resulting mineral assemblages, depend upon the pressure range (Tracy 1978; Le Breton and Thompson 1988), and more specifically on the position of the *P-T* path relative to particular invariant points. Therefore, petrogenetic grids can be used in conjunction with reaction textures to qualitatively determine the *P-T* history of the system provided that textural evidence of the melting/crystallization reactions is preserved. Additional constraints may be placed on the *P-T* path by examining the compositional zoning of refractory phases, such as garnet and plagioclase, participating in the melting reactions.

2.4.1 Melting Sequences and Resulting Mineral Assemblages

Examples of two different reaction sequences in rocks with muscovite and biotite are illustrated in Figure 2.5, taken from Spear et al. (1999). Isobaric heating along path (A), which passes between the invariant points IP1" and IP2", results in the elimination of muscovite by a subsolidus dehydration reaction (reaction [1]) forming K-feldspar and aluminosilicate (Thompson and Tracy 1979). After crossing reaction [1] the path enters the divariant biotite dehydration reaction: Bt + As + Qtz = Grt + Kfs + H_2O (purple area in Figure 2.5) which results in the growth of garnet (Spear et al. 1999). Most of the fluid released upon crossing these two reactions is likely to escape from the site of generation, due to the limited pore space, before the temperature reaches the first melting reaction [4]: Kfs + Qtz + Ab + Grt + As + Bt + H_2O = L. This reaction requires H_2O and is, therefore, not expected to produce a significant amount of melt. Fluid-absent melting will subsequently occur at higher temperatures by the continuous biotite melt reaction mentioned in the previous section (pink area in Figure 2.5) which also consumes kyanite and produces more garnet. However, at this pressure, this reaction covers a narrow field, and biotite, together with aluminosilicate, will mainly melt by the next discontinuous melting reaction [8]: Bt + As + Qtz + Ab = Grt + Crd + Kfs + L, which is responsible for the first appearance of cordierite. At higher temperatures upon crossing reaction [9]: Bt + Grt + Qtz + Ab = Opx + Crd + Kfs + L, garnet will react with any remaining biotite to form orthopyroxene and cordierite. If temperatures continue to increase spinel may form.

Cooling along path (A) results in melt crystallization and progressive release of H_2O that was dissolved in the melt. This H_2O will be consumed to form retrograde biotite at the expense of garnet by the operation of the melting reactions involving biotite mentioned earlier, in the opposite direction. The *P-T* path will then cross the minimum melting reaction [4] resulting in final melt crystallization and release of remaining dissolved H_2O above the stability field of muscovite. Produced H_2O will most likely escape, therefore, no retrograde muscovite can form unless H_2O subsequently becomes available in the rock (i.e., by infiltration).

If the system undergoes isobaric heating above the invariant point [IP1"] and below [IP4"], by path (B), aluminosilicate-bearing assemblages will produce a small amount of melt at the vapor-saturated solidus [3], with the first significant volume of melt being produced by the univariant muscovite melting reaction [2]. Upon elimination of muscovite, biotite will begin to melt by the divariant reaction: Bt + Ky + Qtz ± Ab = Grt + Kfs + L (pink area in Figure 2.5) resulting in garnet growth in the presence of melt. From this stage, the sequence is the same as in path A, provided that biotite persists at the temperature conditions at which reaction [8] is crossed.

If cooling follows the reverse of path (B), H_2O dissolved in the melt will be released during melt crystallization resulting in the consumption of garnet and the formation of retrograde biotite as in path A. This biotite will be dispersed in the matrix and may also form selvages around the leucosomes (Spear et al. 1999). Continued cooling will result in the final crystallization of the melt by the reverse of reaction [2], which releases the remaining dissolved H_2O allowing retrograde muscovite to form in the leucosome or in the matrix as late, crosscutting grains (Spear et al. 1999). The final assemblage will contain less aluminosilicate and very little K-feldspar because both are consumed to produce the retrograde muscovite.

Melting sequences in high pressure metapelites containing phengite may be characterized by several distinctive features that are dependent upon pressure, specifically upon the location of the *P-T* path relative to the discontinuous reaction [R_{II}] (Figure 2.6). If the lowest pressure path (A) is followed, kyanite, biotite, K-feldspar and melt will be produced by dehydration melting of phengite (reaction [R1a]) with the kyanite and biotite then being (partially) consumed by dehydration melting of biotite (reaction [R2]) which produces garnet. This reaction sequence produces the same type of textures as the sequence involving muscovite in the kyanite field (path B, Figure 2.5). In contrast, if the highest pressure path (C) is followed, garnet is produced by the concurrent melting of phengite and biotite by reaction [R3] with any excess phengite being consumed to produce garnet and kyanite by reaction [R4]. If the path followed is at an intermediate pressure (path B), garnet begins growing by reaction [R3], is consumed by reaction [R_{II}] and subsequently begins growing again by reaction [R2]. In other words, garnet experiences a discontinuity in growth.

2.4.2 Compositional Zoning

Zoning refers to compositional heterogeneities of a phase at the grain scale and is linked to inefficient diffusion at that length scale over the time scale of the metamorphic event. Growth zoning mainly characterizes refractory phases such as garnet and results from formation of successive concentric layers of distinct composition that are a function of the *P-T* path, metamorphic reactions responsible for garnet growth, and the composition of the reservoir. At high temperatures, growth zoning tends to be eliminated by diffusion, which is a thermally activated process, especially in the case of fast diffusing elements such as Fe and Mg (Spear et. al 1999). Retrograde zoning develops as a response to a chemical gradient between rims (that reset their compositions as a result of retrograde reactions with the matrix) and the internal parts of the grains.

With respect to major elements in garnet, Ca zoning has been shown to be a useful tool in determining the partial melting reaction history of metapelites (Spear and Kohn 1996; Spear et al. 1999). This is due to the slow diffusion rate of Ca and the participation of plagioclase and garnet in the GASP equilibrium: An = Grs + Ky + Qtz (Newton and Haselton 1981). During partial melting, Na is preferentially incorporated in the melt (for example by the reaction Ms + Ab + Qtz = Ky + Kfs + L), resulting in an increase of the An component of the residual plagioclase. If this An-rich plagioclase is subsequently involved in a garnet forming reaction (for example Bt + As + Pl + Qtz = Grt + Kfs + L), then the new garnet will be enriched in Grs with its Grs content being controlled by the GASP equilibrium. If the new garnet forms around a pre-existing garnet that grew by subsolidus reactions, then the overall zoning pattern will be characterized by a step increase in Grs at the rim domains corresponding to garnet that grew in equilibrium with melt. This type of zoning has been observed in both experiments and natural rocks and suggests that garnet does not easily reach equilibrium with the melt at the grain scale (Vielzeuf & Holloway 1988). Additional discontinuities in Grs zoning may also be used to infer changes in the garnet-producing reactions within the melt domain.

Alm and Prp contents of garnet are temperature dependent and provided that growth zoning is preserved, they can add constraints to the thermal evolution. Figure 2.7 shows the X_{Fe} (= Fe/(Fe+Mg)) isopleths modelled by Spear et al. (1999) for garnet associated with the subsolidus continuous reaction: Bt + Ky + Ab + Qtz = Ms + Grt (pink field) and the continuous biotite dehydration melting reaction: Bt + Ky + Ab + Qtz = Grt + Kfs + L. As shown by Spear et al. (1999), garnet grows along paths which cross decreasing X_{Fe} isopleths and is consumed along paths that cross increasing X_{Fe} isopleths. Thus, garnet with preserved growth zoning typically displays a rimward decrease in $X_{Fe.}$ In contrast, retrograde zoning, due to Fe-Mg exchange between garnet and biotite with decreasing temperature, typically results in an increase of X_{Fe} in the outer rims.

Trace elements in garnet are also expected to show growth zoning profiles owing to slow diffusion rates (Hiroi and Ellis 1994; Spear and Kohn 1996; Pyle and Spear 1999; Yang and Rivers 2001). Trace element zoning patterns of garnet combined with the study of accessory minerals in the assemblage of interest can provide additional constraints on the partial melting history. For instance they may help discriminate between garnet cores that formed by subsolidus reactions and garnet rims formed by biotite dehydration melting. Subsolidus garnet that grew in the presence of a Y-rich phase such as monazite or xenotime commonly displays a bell shaped outward decrease (Pyle and Spear 1999) whereas, rims that grew with melt display flat Y profiles (Indares and Dunning 2001). In addition, sharp peaks in trace element profiles may be used to detect episodes of garnet consumption (Pyle and Spear 1998, 1999; Yang and Rivers 2002) as for instance across reaction [R_{II}] in path B (Figure 2.6; Indares and Dunning 2001). When garnet is resorbed, trace elements that were contained in it such as Y and P are released into the immediate matrix (Pyle and Spear 1999; Yang and Rivers 2002). If the garnet subsequently resumes growth, it may re-incorporate them, resulting in the formation of conspicuous rings of high trace element concentration at the interface between the two garnet generations. For instance, high-P rings, together with a textural discontinuity in garnet porphyroblasts have provided compelling evidence for reaction [R_{II}] involving phengite in some migmatitic metapelites of the MIZ (Indares and Dunning 2001).

In addition, the use of Grs zoning combined with P zoning may help explain the role of apatite in melting reactions, whereas increases in Cr along a garnet rim is compatible with garnet growth by the biotite-dehydration melting reaction because Cr is an abundant trace element in micas (Yang and Rivers 2000). While the importance of trace elements may have been overlooked in the past, preliminary studies of trace elements have shown that they should not be ignored because they may provide important information not available from major elements.

2.4.3 *P-T* Estimation

2.4.3.1 Thermobarometry: methods and limitations

The metamorphic *P-T* conditions at which mineral assemblages achieved equilibrium can be calculated by thermobarometry. At equilibrium conditions, a given set of phase components for which a mass-balanced reaction can be written, obeys the following thermodynamic relation: $\Delta G = \Delta H - T\Delta S + P\Delta V + RTlnK = 0$ with ΔG, ΔH, ΔS, and ΔV being the change in free energy, enthalpy, entropy, and volume of the reaction, *T* and *P* representing temperature and pressure, R being the gas constant and K the equilibrium constant, which is in turn defined as the activity product of the reaction products divided by the activity product of the reactants. Therefore, knowing thermodynamic properties, activity relations and molar fractions of the coexisting phases, it is possible to calculate the location of the equilibrium isopleth in *P-T* space. Assuming all phases are in equilibrium, the intersection of two reaction isopleths, with a temperature-sensitive reaction referred to as a geothermometer and a pressure-sensitive reaction referred to as a geobarometer, gives a specific *P-T* point that represents the *P-T* conditions of equilibrium.

In metapelites, most commonly used reactions are the Fe-Mg exchange between garnet and biotite (thermometer): Alm + Phl = Prp + Ann and the net transfer GASP reaction (barometer): 3An = Grs + 2As + Qtz. Internally consistent databases containing thermodynamic properties and activity models allow calculation of reaction isopleths in *P-T* space (e.g., R. Berman's TWEEQU 202 database; see Berman 1991).

Conditions for equilibrium are assumed to be most favorable at the metamorphic thermal peak, because at peak temperatures, reaction and diffusion rates are maximized. However, before attempting to calculate these conditions, textural criteria and interpretation of chemical zoning of relevant phases should be used to identify mineral compositions that potentially represent the thermal peak and distinguish them from: (a) relict compositions achieved during the prograde path and preserved within refractory phases such as garnet, and (b) compositions achieved during retrogression by Fe-Mg diffusion between adjacent ferromagnesian phases, or by retrograde net transfer reactions. In some cases, *P-T* conditions of local retrograde resetting can be also calculated by using the outer rims of relevant phases. However, the results may be misleading because the closure temperature of thermometers is usually lower than that of barometers. Furthermore, application of these standard thermobarometric techniques to metapelites that display evidence of partial melting is problematic because of the widespread development of retrograde biotite during melt crystallization and in some cases the uncertainty concerning the presence of biotite at the metamorphic peak (see section 2.4.1). Furthermore, the GASP equilibrium can only be used if subsolidus plagioclase can be distinguished from late plagioclase crystallized from the melt.

2.4.3.2 Compositional trends of biotite in high grade rocks

In samples without retrograde biotite, Fe-Mg exchange between garnet and biotite during cooling results in isolated biotite grains in the matrix preserving peak compositions, and such grains have higher X_{Fe} than grains adjacent to garnet (Spear and

Florence 1992). However, retrograde biotite forming by net transfer reactions (such as Bt + As + Qtz = Kfs + Grt + L in the reverse sense) is more Fe-rich than peak biotite and its X_{Fe} will be progressively lowered only if retrograde Fe-Mg exchange continues after the end of the net-transfer reaction (Spear and Florence 1992). This is most likely to happen in grains adjacent to garnet. In addition, biotite stable under high-temperature conditions is expected to be more Ti-rich than biotite formed by retrograde net transfer reactions. Therefore, it should be possible to distinguish between different types of biotite by examining compositional variations with increasing distance from garnet. For example, consider the case of a sample containing both peak and retrograde biotite, the latter being formed by net-transfer reactions consuming garnet. In such a sample, for the reasons given above, biotite adjacent to garnet should be expected to have the lowest X_{Fe} and Ti, biotite in the vicinity of garnet should have the highest X_{Fe} but low Ti, and peak biotite away from garnet would show intermediate X_{Fe} and highest Ti. However, owing to fast diffusion rates in biotite, peak composition of biotite is rarely preserved, and the trend described above can be easily blurred or even entirely obliterated (Spear and Florence 1992). Therefore, peak metamorphic temperatures cannot be reliably calculated by garnet-biotite thermometry in high grade rocks. This problem is accentuated in pelitic rocks that reached the *P-T* field of biotite dehydration melting, as large amounts of retrograde biotite are expected to form during cooling (see section 2.4.1).

2.4.3.3 Garnet X_{Fe} and GASP isopleths as *P-T* indicators in migmatitic metapelites

In addition to 'conventional' thermobarometry, isopleths representing X_{Fe} of garnet in a number of *P-T* fields including the melt domain, have been established for pelitic systems by Spear et al. (1999). The distribution of these isopleths in the kyanite field is shown in Figure 2.7. These isopleths, together with relevant GASP isopleths, and their intersection with the univariant muscovite-out reaction can give information on the *P-T* evolution, provided that garnet growth zoning and different generations of plagioclase are preserved. This approach can also be used if the white mica was phengite instead of muscovite because the phengite-out reaction [R1a] (Figure 2.6) is located close to the muscovite-out reaction ([R1] in Figure 2.6), and, although divariant in the KFMASH system, its width is narrow (see section 2.3.2.5) (Vielzeuf and Holloway 1988).

The pressure and temperature conditions at which white mica was eliminated and biotite dehydration melting began (Figure 2.7) can be constrained by finding the intersection of the muscovite-out reaction (which corresponds to [R1]) and the X_{Fe} garnet and/or GASP isopleth calculated using the composition of either the first garnet which grew with melt or the last garnet that grew before melt (Indares and Dunning 2001). In order to calculate the GASP isopleth for the first case, a garnet rim composition enriched in Grs should be used along with a subsolidus plagioclase rim enriched in An (see section 2.4.2). In the latter case, a subsolidus garnet composition, i.e. in core areas adjacent to the Grs enriched rims, should be used along with a subsolidus plagioclase that acquired its composition before melting. The problem is that preservation of the two types of plagioclase is highly unlikely. However, if appropriate plagioclase is not present, garnet with the highest Grs composition together with plagioclase with maximum An away from garnet (i.e. not linked with garnet breakdown during retrogression) can be used to define a GASP isopleth that sets the high pressure limit for the crossing of the muscovite-out reaction. This is because the actual plagioclase present at the beginning of melt was likely more An-rich, and increased An displaces GASP isopleths to lower pressures (see section 2.4.2).

The garnet X_{Fe} isopleths that can be used to estimate the temperature in the above cases would be that of the same garnet analyses used to calculate the GASP isopleths while the maximum temperature experienced by the sample can be determined by the lowest X_{Fe} isopleth in garnet. Obviously, use of X_{Fe} isopleths requires that growth zoning in terms of Prp and Alm is preserved. However, even in this case, the use of X_{Fe} isopleths in HP metapelites from the MIZ has shown that they may seriously underestimate temperature conditions for high X_{Fe} rocks (Indares and Dunning 2001).

The intersection of the muscovite-out reaction and the GASP and X_{Fe} isopleths (Figure 2.7) can also be used to determine the retrograde conditions at which the divariant biotite-out reaction, (reaction [R2] in Figure 2.6) operating in the reverse sense, ceased during cooling and melt crystallization. The GASP isopleth of interest would be calculated using the composition of outer garnet rims and adjacent plagioclase rims.

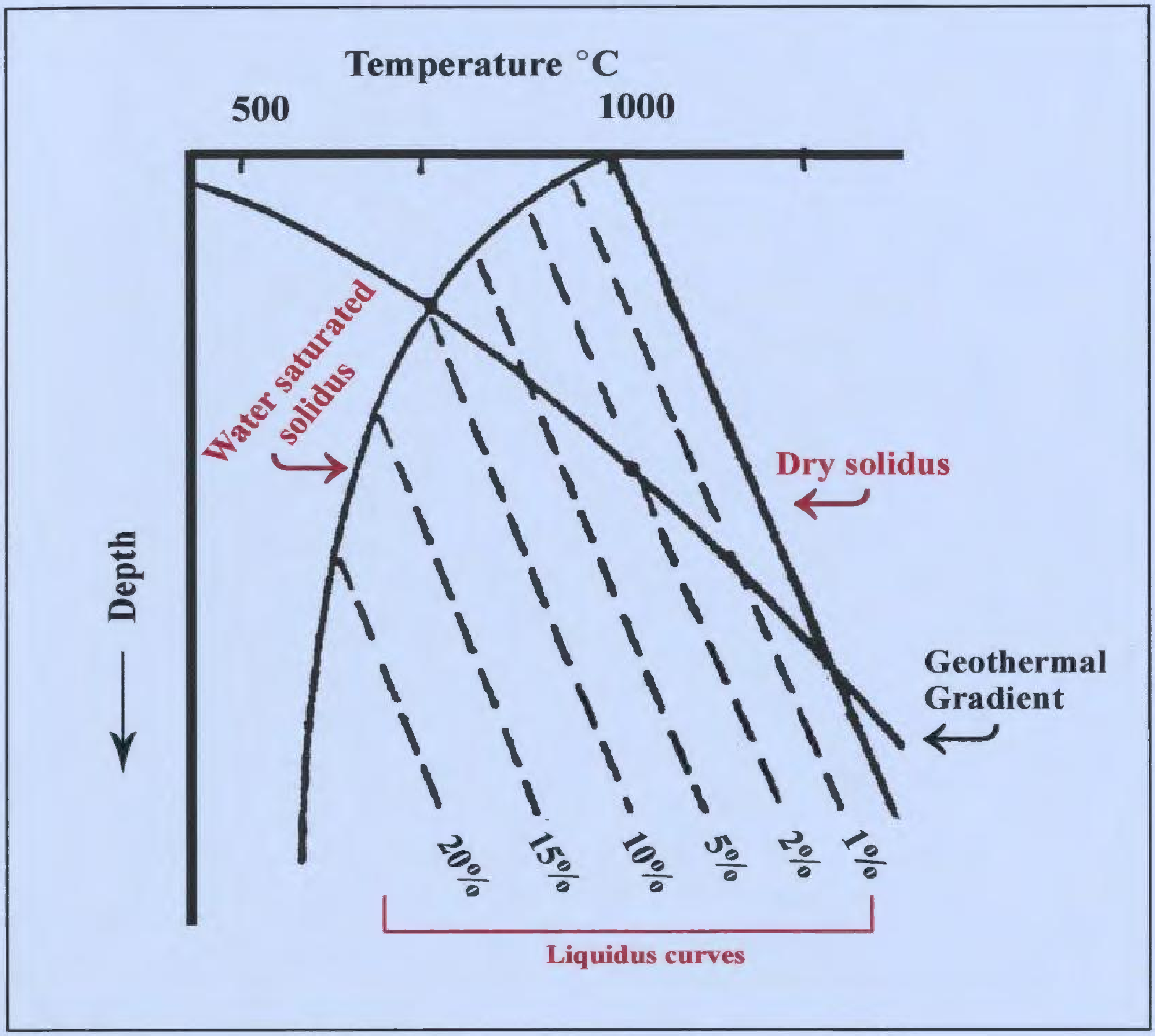


Figure 2.1: Liquidus curves for minimum melt compositions in the system Qtz-Ab-Or-H_2O with the percentage of H_2O dissolved in the melt specified (after McBirney 1992).

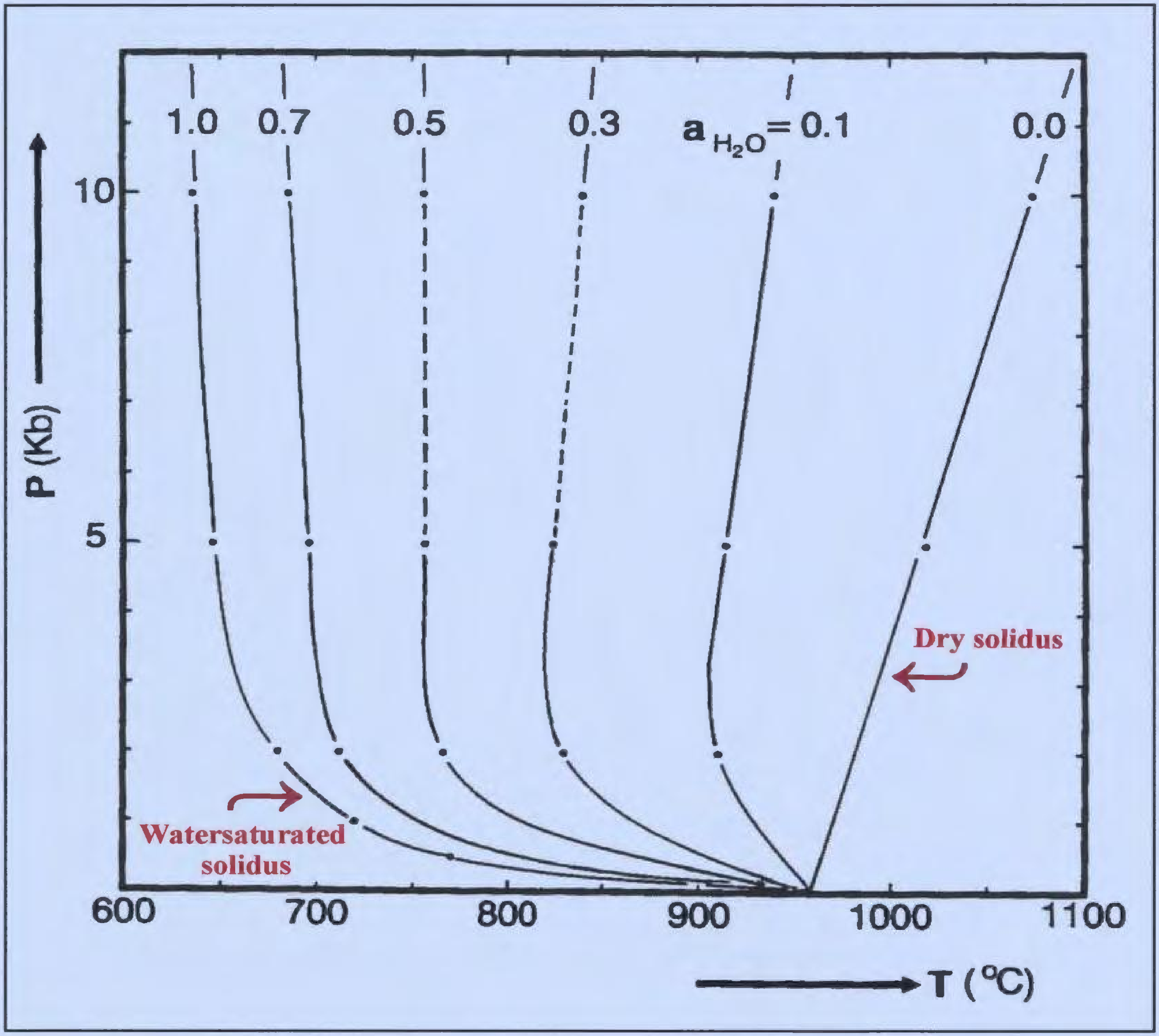


Figure 2.2: Solidus curves of the system Qtz-Ab-Or-H_2O-CO_2. Each solidus curve is for a specific a_{H2O} in the fluid phase (after Johannes and Holtz 1990).

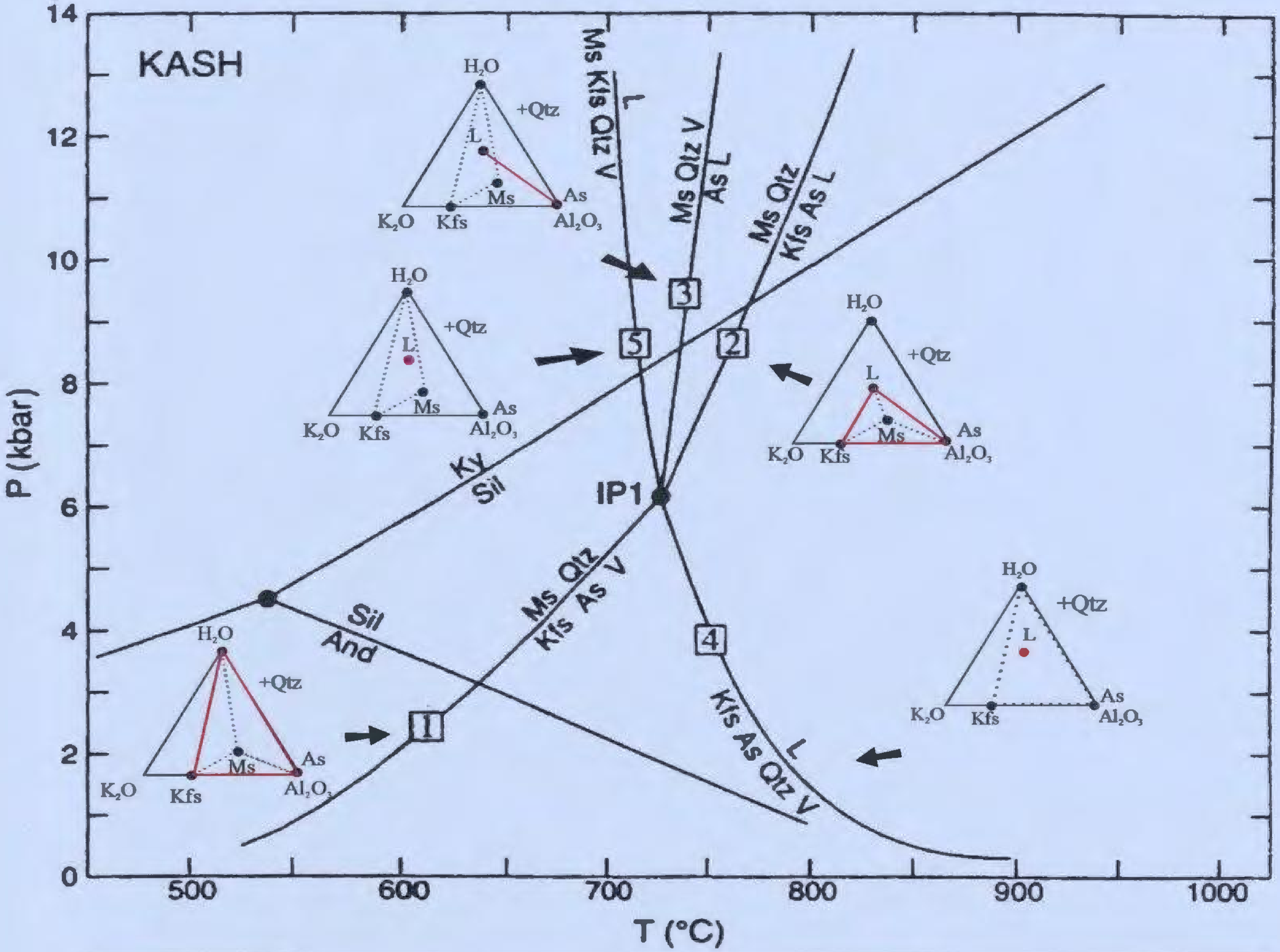


Figure 2.3: *P-T* diagram showing the locations of selected reactions in the KASH system. Compositional phase diagrams are shown for each reaction with reactants being connected by dotted black tie lines and products with red solid tie lines (modified after Spear 1993).

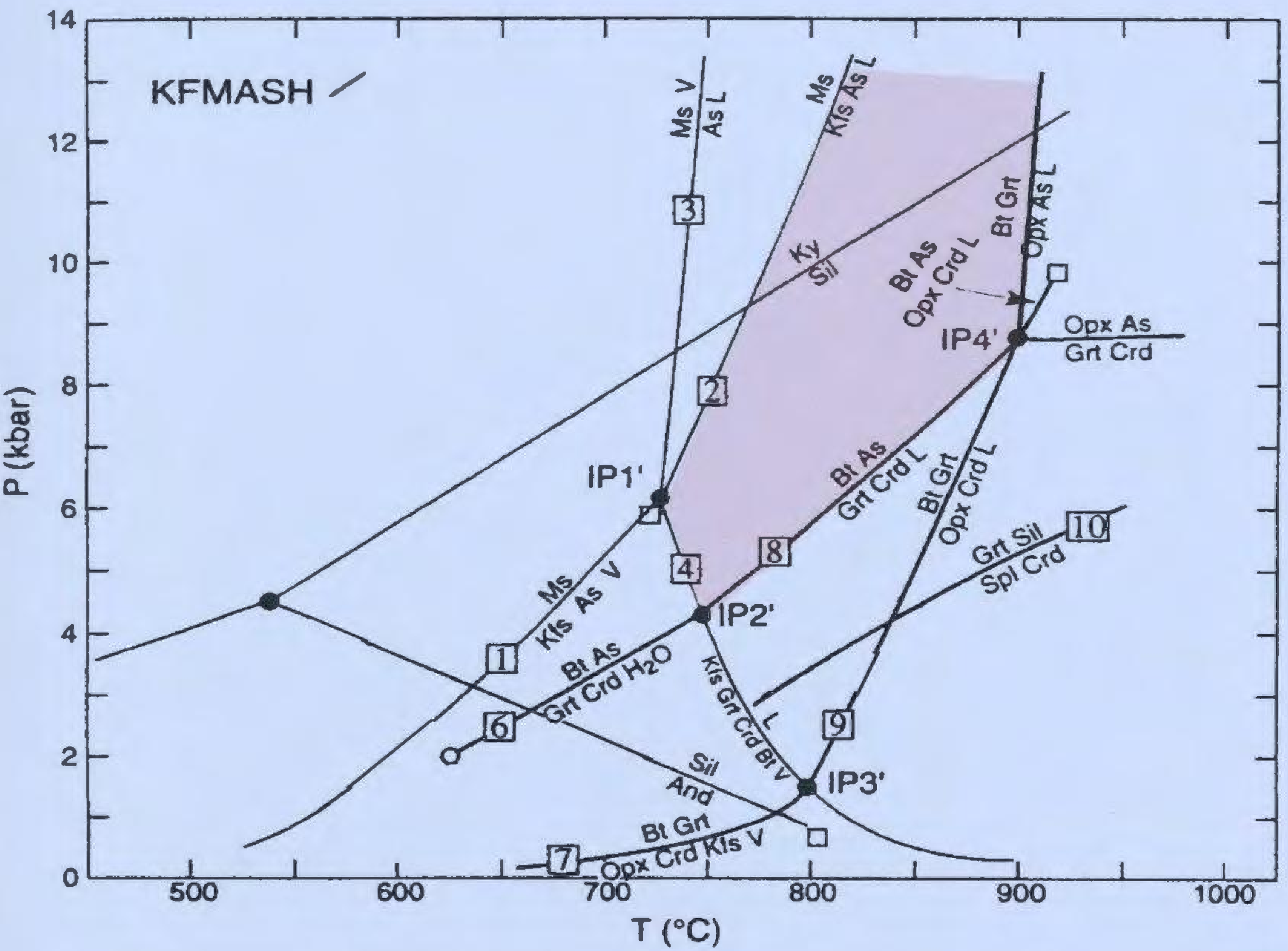


Figure 2.4: *P-T* grid showing the locations of selected melting and dehydration reactions in the KFMASH system (after Spear et al. 1999). Solid lines are univariant reactions and the area shaded in pink represents the stability field of the divariant biotite melting reaction Bt+As+Qtz =Grt+Kfs+L. It is important to note that: (a) quartz is assumed to be a reactant in all reactions; (b) all reactions produce K-feldspar (therefore all univariant reactions involve 7 phases as expected in the KFMASH system; and (c) no free H_2O exists in the melt domain.

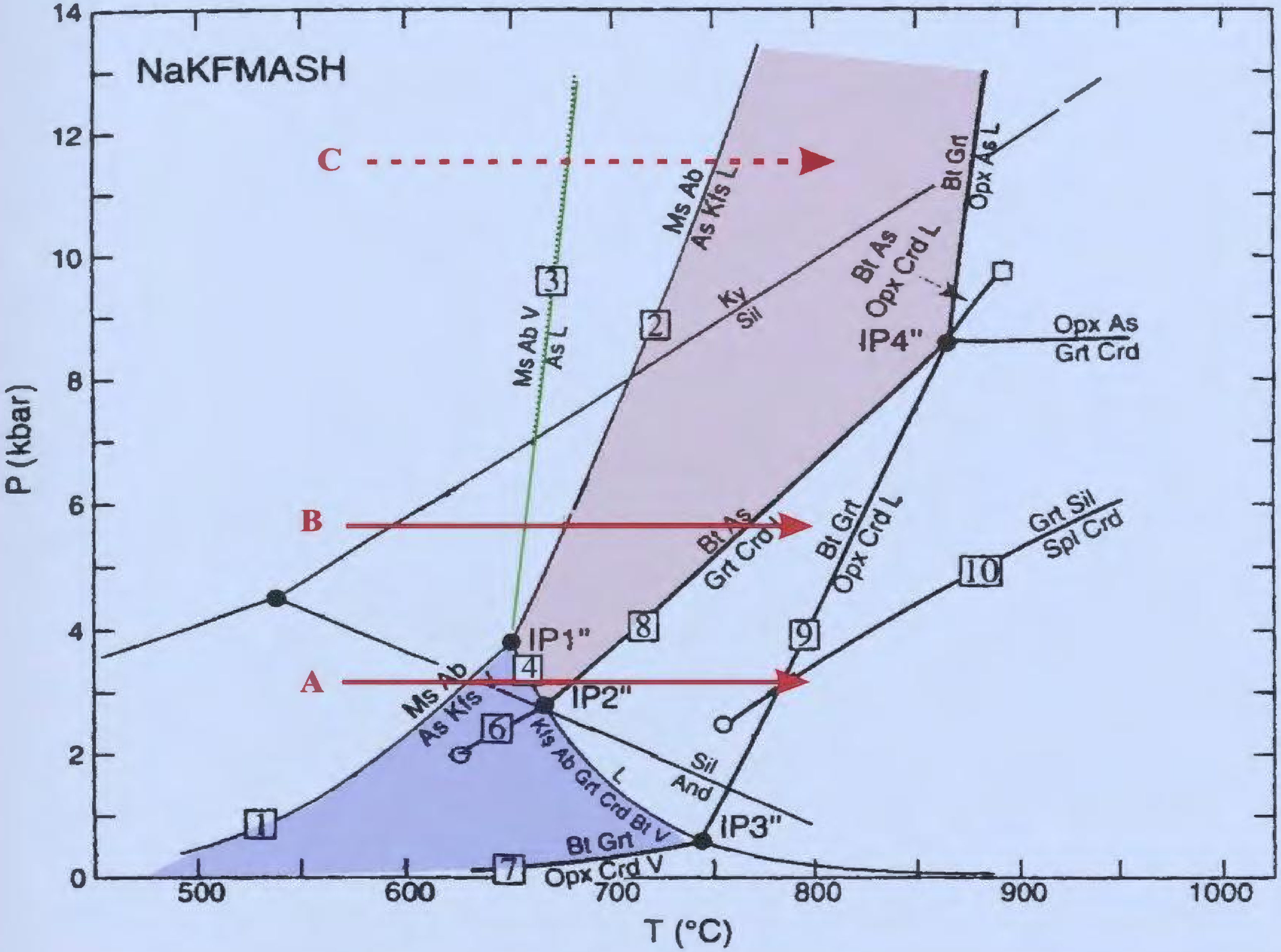


Figure 2.5: *P-T* diagram showing the locations of selected melting and dehydration reactions in the NaKFMASH system (after Spear et al.1999). The pelite vapor-saturated melting reaction is shown in green while the KFASH and KMASH reactions have been omitted for simplification. The area shaded in pink represents the stability field of the continuous biotite dehydration melting reaction: Bt+As=Grt+Kfs+L while the purple region represents the area of a continuous biotite dehydration reaction: Bt+As=Grt+Kfs+Qtz+H_2O. Paths A, B, and C are discussed in section 2.4.1.

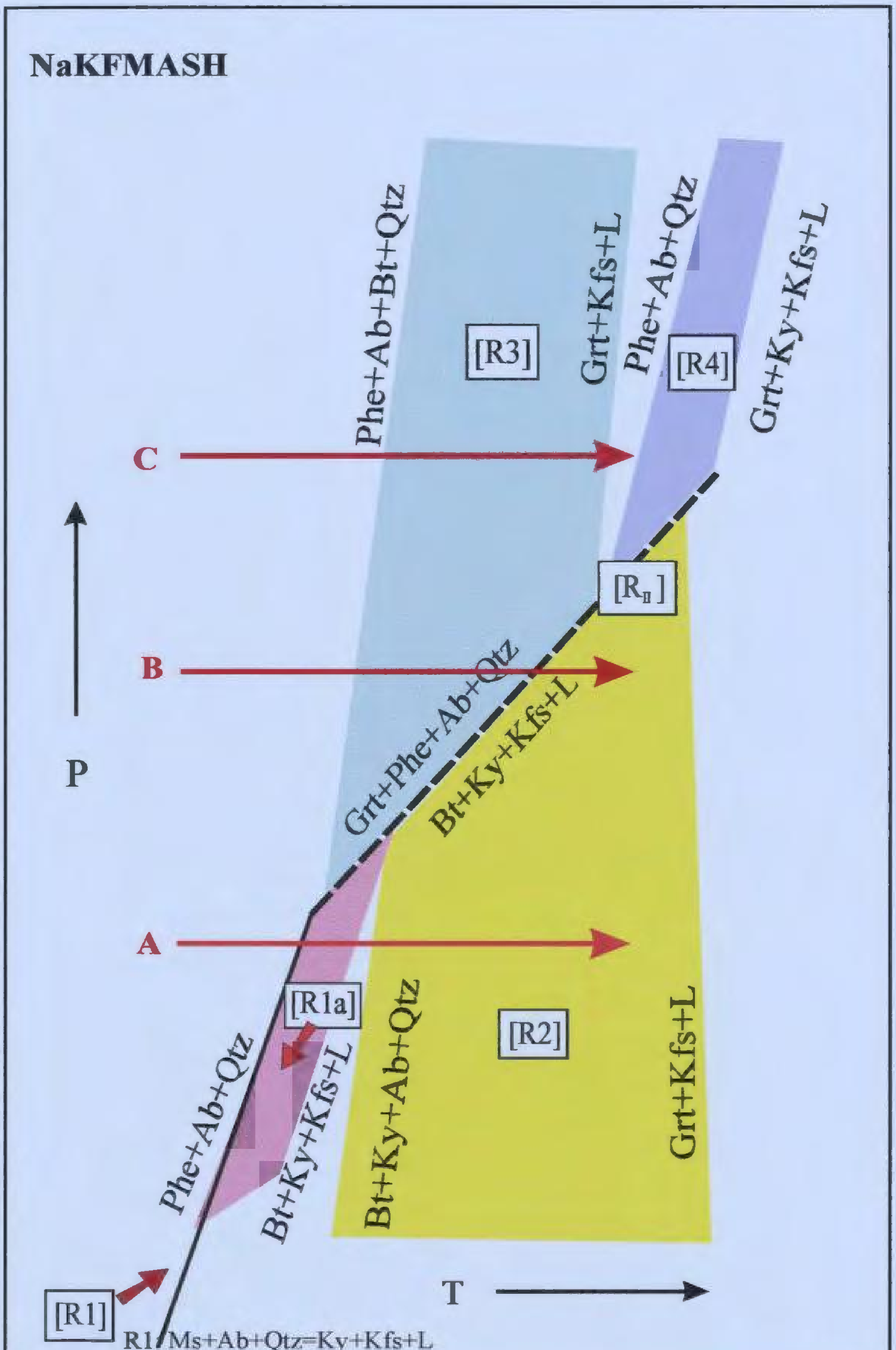


Figure 2.6: Schematic *P-T* grid showing the locations of selected dehydration reactions involving white mica and/or biotite (modified after Indares and Dunning 2001). Paths A, B, and C are discussed in section 2.4.1.

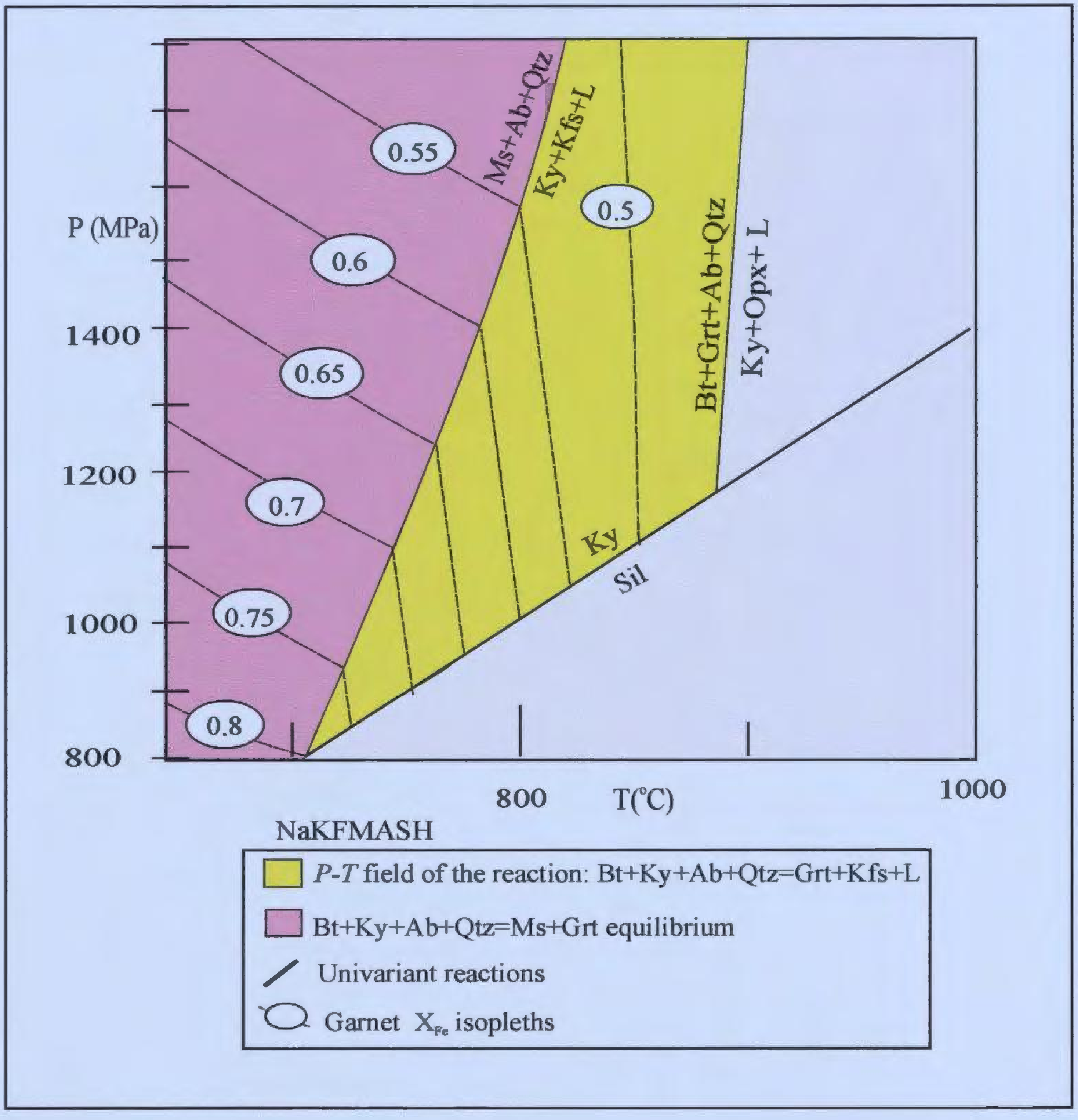


Figure 2.7: *P-T* diagram showing X_{Fe} garnet isopleths on both sides of the muscovite dehydration melting reaction within the kyanite field in the NaKFMASH system (after Spear et al. 1999; Indares and Dunning 2001). The discontinuous muscovite-out reaction and the continuous biotite-out reaction correspond to reactions [R1] and [R2] respectively of Figure 2.6.

CHAPTER 3: METHODS AND ANALYTICAL CONDITIONS

Migmatitic metapelites from the Gagnon terrane were studied and interpreted in terms of *P-T* evolution using methods described in the previous chapter. The general approach includes: (a) textural analysis to identify the mineral assemblage and any textures that may be related to partial melting or melt crystallization; (b) qualitative *P-T* interpretation of textures using published petrogenetic grids; (c) determination of bulk rock composition, mineral compositions and zoning patterns using an electron microprobe; (d) interpretation of the analytical data using the information presented in the previous chapter; and (e) estimation of qualitative *P-T* conditions using petrogenetic grids, GASP isopleths and X_{Fe} isopleths of garnet.

3.1 ANALYTICAL METHODS

Microprobe analyses included a bulk chemical analysis of selected areas of each sample and analyses of the individual minerals in terms of major elements (quantitative) and selected trace elements (Y, Sc, P, Cr, Ti: qualitative). Bulk rock data derived by rastering the electron beam across the thin section and using appropriate software to process the data has been found to be equivalent to that derived from XRF analysis of a rock power from the same sample (Indares, personal communication). An advantage of the microprobe method is that the composition of the exact textural domains which are observed in thin section, can be determined. Bulk analyses in terms of major elements are required to evaluate: (a) to what extent the studied samples have the composition of a typical pelite; and (b) the bulk X_{Mg} of the samples. The latter is important in constraining the melting reaction responsible for the elimination of biotite in a given sample (see section 2.3.2.3). Analyses of individual phases were performed in order to detect: (a) composition at specific points of grains (quantitative), and (b) chemical variation across individual grains and in between grains (quantitative and qualitative). These were used to constrain: (a) the relative timing of growth of phases in specific microtextural settings relative to the partial melting/melt crystallization history; and (b) the *P-T* path (by application of thermobarometry).

Garnet was analyzed along specific transects to evaluate zoning. As well, qualitative major (Fe, Mg, Ca) and trace (Y, Sc, P, Cr, Ti) element X-ray maps of garnet were completed to reveal two dimensional variations in composition. However, only preliminary interpretations of trace element zoning in garnet were made. Plagioclase grains were analyzed in rim to rim transects to detect zoning. Quantitative core and rim analyses of biotite were also performed. Plagioclase and biotite were analyzed in a maximum of four specific textural (T) settings: grains included in garnet (T1); grains in aggregates associated with garnet: touching garnet (T2) and away from garnet (T3); and grains apparently isolated in the matrix within a two dimensional context (T4). These distinctions are essential because biotite and plagioclase in different textural settings may have formed or equilibrated at different times during the metamorphic evolution. For example, biotite in aggregates associated with the garnet may be retrograde, i.e., formed during melt crystallization, whereas isolated biotite may have been present during the peak metamorphic conditions if it escaped melting. In the same way, plagioclase may be represented by grains that formed either by subsolidus reactions and escaped melting, or by crystallization of leucosomes during cooling, or by replacement of garnet. Spot analyses of K-feldspar and muscovite were also performed. The number and type of analyses are shown in Table 1 in Appendix 1, the bulk compositions are listed in Appendix 2, and the raw data for each mineral are listed in Appendices 3-6.

The GASP isopleths were calculated using the TWEEQU 202 software (based on TWQ, Berman 1991) and the solution models of Berman and Aranovich (1996) for ferromagnesian phases, and Fuhrman and Lindsley (1988) for plagioclase. The petrogenetic grid used to display these isopleths is shown in Figure 2.7. The discontinuous muscovite-out reaction and the continuous biotite-out reaction correspond to reactions [R1] and [R2], respectively, of Figure 2.6. The compositions used for thermobarometry are shown in Appendix 7.

3.2 ANALYTICAL CONDITIONS

All mineral and bulk analyses were performed at Memorial University on a CAMECA SX50 electron probe microanalyzer with three WD (wavelength dispersive) spectrometers and a Link ED (energy dispersive) spectometer. Bulk analyses, analytical 'traverses' across mineral grains, and X-ray composition maps of garnet were all completed using MUN-ESD programs. Bulk analyses in terms of Si, Al, Fe, Mg, Mn, Ca, Ti, Na and K were performed on a representative portion of each thin-section at a 20 nA specimen current in ED mode, with the stage moving under a fixed beam. Major element analyses of garnet, muscovite and biotite were done in ED mode with 15 kV accelerating voltage, 20 nA specimen current, beam diameter of 1 μm and a counting time of 50 seconds for garnet and 75 seconds for micas and feldspars. Analyses of feldspars were done using a lower specimen current of 10 nA and a larger beam diameter of 3 μm in order to avoid Na loss. All quantitative data were reduced by the ZAF correction program. Trace element analyses of garnet were completed in WD mode with 15 kV accelerating voltage, 250 nA specimen current and a counting time of five seconds. Compositional maps of garnet (Ca, Fe, Mg, Y, P, Cr) were produced in WD mode using a grid of 256 X 256 pixels, 20 kV accelerating voltage and a 100-200 nA specimen current depending on the zoning intensity.

3.3 PRESENTATION OF THE DATA

In the ensuing chapters 4 to 7, samples from typical zone 7 migmatitic metapelites from the SW Gagnon terrane, are discussed in detail. These include kyanite-bearing rocks from the three thrust slices (Chapters 4-6; see Figure 1.2) and the sillimanite-bearing rocks from the shear zone which forms the southern boundary of the Gagnon terrane (Chapter 7; see Figure 1.2). Slices are numbered consecutively from north to south with the shear zone being the most southerly location sampled. The following samples were studied in detail: Slice #1-sample 100; Slice #2-samples 11E and 31A; Slice #3-samples 207, 208 and 282; and area #4 - shear zone - samples 287 and 288.

In Chapter 8 the partial melting histories of the metapelites from the SW Gagnon terrane are compared with those of migmatitic kyanite-bearing metapelites that straddle metamorphic zones 6 and 7 in the SE Gagnon terrane (Schwarz 1998; Indares 1995; see section 1.5). To this end, complementary data on garnet zoning were obtained and integrated with the existing data from Schwarz (1998) (sample S-218) and Indares (1995) (samples 9, 70 and 240). Finally, Chapter 9 summarizes the conclusions of this study.

CHAPTER 4: PETROLOGY AND METAMORPHIC INTERPRETATION OF METAPELITE FROM THRUST SLICE #1

Slice #1 is the northernmost thrust slice with supracrustal rocks in the SW Gagnon terrane (Figure 1.2). It contains variably sheared kyanite-bearing metapelite with alternating biotite-rich and quartz-rich layers and small amounts of stretched leucosome, together with quartzite and iron formation. A representative sample of metapelite (sample 100) was chosen for detailed study. This sample has a typical pelitic composition (Table 2.1-Appendix 2) and is iron rich ($X_{Mg} = 0.33$).

4.1 MINERALOGY AND TEXTURE

The sample consists mainly of quartz, biotite and garnet with subordinate amounts of plagioclase, K-feldspar, kyanite and muscovite. Minor apatite occurs as inclusions in garnet and biotite and is locally found along biotite rims in the matrix. The texture is characterized by alternating coarse- and fine-grained discontinuous layers and pods. The coarse-grained layers are dominated by recrystallized quartz ribbons (Plate 4.1), whereas the fine-grained layers (Plate 4.2) and pods (Plate 4.3) contain abundant biotite ± kyanite with subordinate plagioclase and K-feldspar. The orientation of the quartz ribbons, biotite, and kyanite define the foliation.

Garnet occurs as subidioblastic porphyroblasts and amorphous relics, the latter type being restricted to the fine-grained layers. Garnet cores generally contain inclusions of sub-millimetric apatite, biotite, muscovite, quartz, and plagioclase. Large porphyroblasts also contain aggregates of millimetric quartz and plagioclase inclusions.

Two of the largest garnet porphyroblasts (> 4500 μm) were selected for microprobe analysis and are referred to as Garnet I and Garnet II respectively. Garnet I is elongate parallel to the general foliation and contains clusters of inclusions also oriented parallel to the foliation (Plate 4.4). Garnet II, on the other hand, is subidioblastic with the inclusions being concentrated in the core and in one particular rim area (Plate 4.5). Garnet relics in the fine-grained layers (Plate 4.6), as well as parts of Garnet II (Plate 4.5), are corroded by aggregates of kyanite, biotite, plagioclase and quartz (Plate 4.6), with what appears to be one former garnet being completely pseudomorphed by these minerals (Plate 4.7).

Locally muscovite is intergrown with biotite and it also occurs as porphyroblasts containing corroded K-feldspar inclusions (Plate 4.8). Biotite and K-feldspar are more abundant in the fine-grained areas, with the latter showing microcline twinning and sericitic alteration. Subordinate plagioclase and kyanite are restricted to the fine-grained aggregates replacing garnet.

Interpretation

The textural heterogeneity of this sample is likely a result of partial melting with the coarse quartz-rich areas (Plate 4.1) and fine-grained pods and layers (Plates 4.2 and 4.3) representing mainly solid residue and melt-related assemblages respectively. The presence of the sub-assemblage K-feldspar + kyanite is consistent with elimination of white mica by the reaction: Ms + Qtz ± Ab = Kfs + Ky + L ([R1], Figure 2.6) or alternatively, by the reaction: Phe + Ab + Qtz = Bt + Ky + Kfs + L ([R1a]), with maximum *P-T* conditions in the field of the continuous reaction: Bt + Ky + Qtz + Ab = Grt + Kfs + L ([R2], Figure 2.6). The extent to which reaction [R2] occurred, however, cannot be established from textural analysis because of subsequent deformation and recrystallization.

The kyanite + biotite + plagioclase + quartz aggregates, which occur in the fine-grained domains and locally corrode garnet (Plates 4.3, 4.5 and 4.6), are likely the result of melt crystallization by reaction [R2] operating in the reverse sense during cooling. Matrix biotite isolated from garnet may also be retrograde, or alternatively, peak biotite that survived melting by reaction [R2] and then recrystallized during subsequent deformation. The muscovite locally intergrown with biotite and replacing K-feldspar (Plate 4.8) is interpreted as retrograde and is a likely product of reaction [R1] operating in the reverse sense during final melt crystallization in the muscovite stability field.

4.2 MINERAL COMPOSITION

4.2.1 Garnet

Garnets I (Plate 4.4) and II (Plate 4.5) were analysed in one rim-core-rim traverse in each grain (Figures 4.1 and 4.2; Tables 3.1a and 3.2a -Appendix 3). In addition, X-ray maps were made of Garnet II (Figure 4.3). Both garnets are relatively Grs-rich and their compositions overlap in the range of Alm $_{61-69}$, Prp $_{16-24}$, Grs $_{9-20}$, Sps $_{2-4}$ (Table 4.1).

Garnet cores are relatively homogeneous (Alm $_{60-65}$, Prp $_{22-24}$, Grs $_{10-15}$, Sps $_{2-4}$), with the exception of minor compositional variations associated with inclusions. The outer 1000-1500 μm of the rims, on the other hand, are variably zoned (Figures 4.1a, 4.2a and 4.3). Rim zoning is characterized by: (a) patchy areas enriched in Grs (17-20%) relative to the core (12-14%), whereas the outer 250-500 μm locally display a drop in Grs to 9-11%; and (b) a progressive overall decrease in Prp (25→18-21%) and increase in Alm (66→69%). The latter trends are interrupted locally by Prp troughs and Alm peaks in the high Grs areas. Sps contents are uniform with a very slight increase over the outer ~200 μm rims of both garnets.

With respect to trace elements (Tables 3.1b and 3.2b - Appendix 3), notable zoning trends include: (a) an outward increase of Cr in the Grs-enriched rims of Garnet II (Figures 4.2b and 4.3); (b) a slight decrease of Sc in the outer rims of the same garnet (Figure 4.2b) and (c) a P increase in Grs-enriched rims of all garnets (Figures 4.1b, 4.2b and 4.3e). In addition the Y X-ray map of Garnet II shows irregular areas of Y-enrichment in the core, but to the left and right of the inclusion-rich zone (Figure 4.3f).

Interpretation

The homogeneity of the garnet cores in terms of Grs may be a growth feature, or due to diffusional homogenization at high temperatures. In either case, homogeneous garnet cores surrounded by Grs-rich rims (Figure 4.3a) are consistent with initial growth (core) by subsolidus reaction(s), followed by growth in the presence of melt, as for instance during dehydration melting of biotite by reaction [R2] (Grs-rich rim domains; see section 2.4.2, Figure 2.7). The outward decrease in Prp and increase in Alm (Figures 4.1a and 4.2a) is consistent with diffusional resetting by retrograde Fe-Mg exchange between garnet and biotite and/or partial consumption of garnet rims during melt crystallization by reaction [R2] operating in the reverse sense. The latter alternative is supported by the slight increase in Sps and may also be responsible for the outermost decrease in Grs in some rims. Preservation of growth zoning in terms of Grs and the development of retrograde zoning trends in terms of Alm and Prp (Figures 4.1a and 4.2a) is possible owing to faster diffusion rates of Fe and Mg relative to Ca in garnet (Spear et al. 1999).

Correlation between P and Grs zoning (Figures 4.1b and 4.2b) may be due to breakdown of apatite during the growth of the Grs-enriched rims by reaction [R2]. The increase in Cr at the rims is consistent with Cr being released from muscovite and (or) biotite by reactions [R1] and [R2], respectively, and subsequently incorporated into rims of the garnet as it grew by reaction [R2]. Finally, the patchy Y-enriched areas in the core of Garnet II are consistent with growth by subsolidus reactions in the presence of a Y-rich phase (monazite, xenotine) (e.g., Pyle and Spear 1999, 2000; Pyle et al. 2001). Even though the Y-enrichment is very slight and no Y-rich phases were found within the garnet, this trend probably indicates the former existence of a Y-enriched phase (Yang and Rivers 2002). The distribution of these patches may also indicate that the core area first grew as two distinct subgrains that coalesced latter along the inclusion-rich zone.

4.2.2 Biotite

Biotite occurs mainly in the fine-grained domains. The composition of biotite in aggregates partially replacing garnet overlaps with that of isolated matrix grains, with X_{Fe} in the range of 0.42-0.57 (Table 4.2). Biotite aggregates locally display high X_{Fe}, whereas most biotite immediately adjacent to garnet has the lowest X_{Fe} and matrix biotite has, on average, intermediate X_{Fe} values (Figures 4.4a and 4.4b, Table 4.1 - Appendix 4). Individual grains are homogeneous with the exception of three analysed grains adjacent to garnet that display a rimward decrease in X_{Fe} (near Garnet I: 0.50→0.48, and near Garnet II: 0.52→0.47, 0.55→0.50).

The amount of Ti in the octahedral sites of all types of biotite is between 0.17 to 0.25 per formula unit (p.f.u.; Figures 4.5a and 4.6a), but there is a general correlation between Ti and X_{Fe} in the case of aggregates associated with Garnet II (Figure 4.6a). All biotite grains have decreasing Al^{VI} with increasing Ti (Figures 4.5c and 4.6c).

Interpretation

Highest X_{Fe} in biotite from aggregates replacing garnet further supports textural evidence of biotite growth by a retrograde net transfer reaction during melt crystallization, (for example, reaction [R2] operating in the reverse sense). However, low X_{Fe} in most of the grains in contact with garnet is consistent with continuation of Fe-Mg exchange between garnet and biotite at temperatures below the blocking of the net transfer reaction. Intermediate X_{Fe} in isolated matrix biotite suggests that these grains may have been stable at the thermal peak (see section 2.4.3.2), although weak compositional gradients make it unlikely that matrix biotite preserved an unmodified peak composition.

Ti in biotite may be correlated with temperature (see section 2.4.3.2) with biotite formed under high temperature conditions expected to be more Ti-rich than biotite formed by retrograde net transfer reactions. Matrix biotite tends to have the highest Ti contents which is consistent with either: (a) persistence of peak biotite in the matrix, variably reset in terms of Fe-Mg , or (b) first growth of retrograde biotite in the matrix, away from garnet during cooling. The inverse correlation between Ti and Al^{VI} (Figures 4.5c and 4.6c) reflects the fact that elements occupy the same crystallographic site.

4.2.3 Plagioclase

Matrix plagioclase is restricted to the fine-grained domains. The chemical composition of the analysed plagioclase grains included in garnet, grains in the matrix and those adjacent to garnet reaction zones, covers a narrow range with An contents between 31-38% (Table 4.3, Table 5.1 - Appendix 5). Individual grains are chemically homogeneous with the exception of an occasional slight decrease in the outer rims of matrix grains from 38 to 33-35% An (Figure 4.7a), and an increase in An from 32 to 34% (Figure 4.7b) in the outer rim of a grain adjacent to the kyanite + biotite + quartz + plagioclase aggregates replacing garnet.

Restriction of plagioclase to the fine-grained domains suggests that it was produced during melt crystallization by the reverse of reaction [R2]. Outward decrease in An in some grains is consistent with progressive crystallization of plagioclase from the melt under decreasing temperatures whereas the opposite trend in a grain adjacent to the garnet reaction zone may indicate an increase in the availability of Ca owing to garnet breakdown.

4.2.4 Muscovite

Analyses of the cores and rims of six muscovite grains reveal a composition close to that of ideal muscovite, with low Na and minor Fe and Mg contents and a slight Si excess over the ideal Si content (Table 4.4, Table 6.1 - Appendix 6), suggesting negligible paragonite and only minor celadonite substitution which is responsible for the formation of phengite. Therefore, final melt crystallization is likely to have occurred under conditions at which muscovite was stable rather than phengite.

4.3 SUMMARY AND *P-T* CONSTRAINTS

4.3.1 Summary

Sample 100 from the northernmost thrust slice (Figure 1.2), displays a number of features consistent with dehydration melting of micas by reactions such as [R1]: Ms + Qtz ± Ab = Kfs + Ky + L (or alternatively [R1a]: Phe + Ab + Qtz = Bt + Ky + Kfs + L) and reaction [R2]: Bt + Ky + Qtz ± Ab = Grt + Kfs + L (Figure 2.7):

(1) Mineral assemblage and textural heterogeneity

The absence of primary muscovite and the presence of K-feldspar and kyanite indicates that reaction [R1] (or [R1a] if the white mica was phengite-rich) has been crossed and the sample reached the pressure-temperature field of reaction [R2] (Figure 4.8a - segment A). In this context, as noted previously, the coarse quartz-rich areas (Plate 4.1) and fine-grained plagioclase + K-feldspar bearing pods and layers (Plates 4.2 and 4.3) likely represent solid residue and leucosome respectively. Although textural data do not allow discrimination between reactions [R1] and [R1a], a *P-T* grid that shows the location of reaction [R1] provides an appropriate background to qualitatively illustrate this evolution because the two reactions are located close to each other in the *P-T* field (section 2.3.2.5).

(2) Garnet zoning

Homogeneous garnet cores locally enriched in Y, surrounded by Grs- and Cr-enriched rims (Figures 4.1a and 4.2b) are consistent with initial growth by subsolidus reaction(s) followed by development of the rim domains by reaction [R2] (see section 2.4.2). P-enrichment in garnet near the rim may be related to breakdown of a phosphate during prograde metamorphism.

In addition the following textural features are related to melt crystallization.

(1) Aggregates replacing corroded garnet

The kyanite + biotite + plagioclase + quartz aggregates partially replacing garnet (Plates 4.5 and 4.6) in the fine-grained domains (Plate 4.3) are likely the result of reaction [R2] operating in the reverse sense and were promoted by fluids released from the melt during crystallization. Garnet resorption is further supported by the Sps and X_{Fe} increase and local Grs decrease at the outer rims of garnet, high X_{Fe} in some biotite grains in aggregates replacing garnet, and the inverse zoning of plagioclase adjacent to these aggregates.

(2) Late muscovite

The muscovite locally intergrown with biotite and replacing K-feldspar (Plate 4.8) is interpreted as a retrograde product of [R1] operating in the reverse sense during final melt crystallization in the muscovite stability field (Figure 4.8a - segment B).

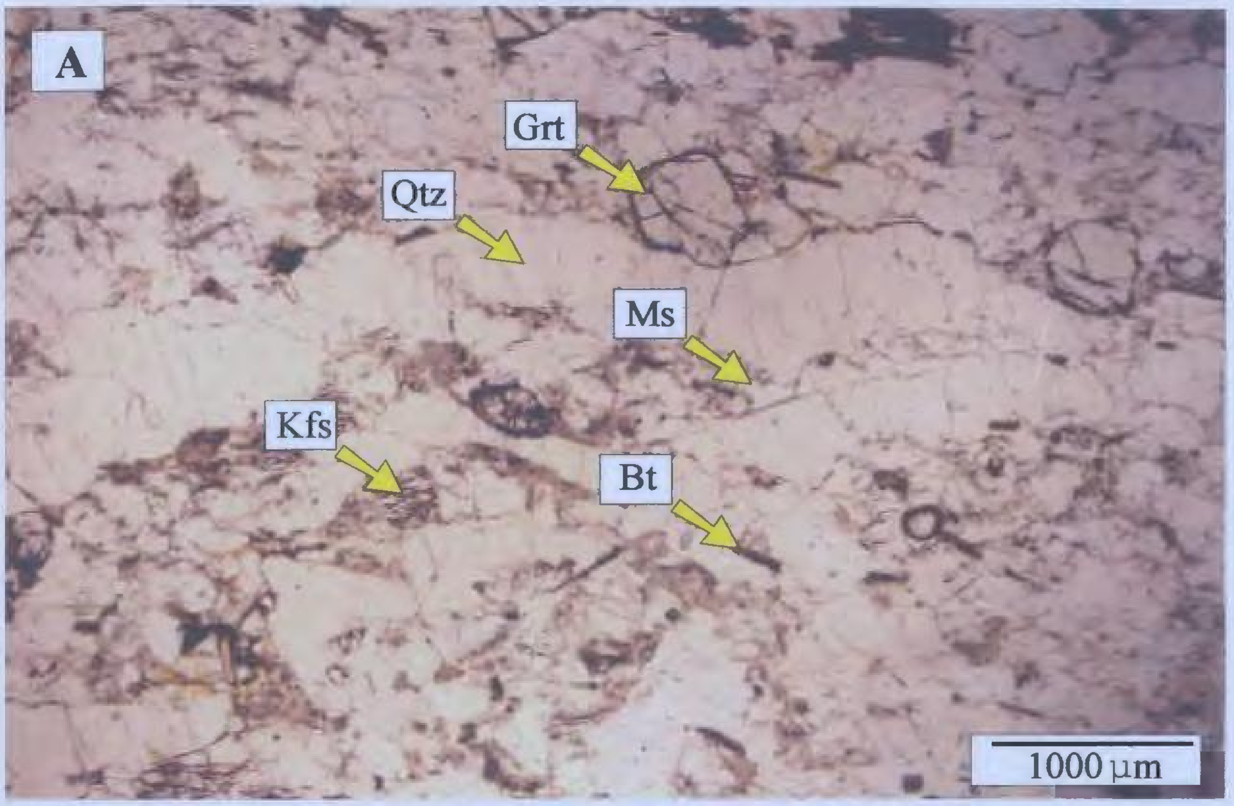
In conclusion, sample 100 in the northernmost slice, appears to have followed a prograde path that crossed the white mica dehydration melting reaction [R1] or [R1a] and ended within the *P-T* field of the biotite dehydration melting reaction [R2] and within the stability field of kyanite. The extent to which reaction [R2] occurred, however, cannot be established from available data. The *P-T* history subsequently followed a retrograde path with melt crystallization starting in the field of reaction [R2], again in the stability field of kyanite, and ending in the muscovite stability field.

4.3.2 Further *P-T* Constraints

Quantitative estimations of *P-T* conditions are limited by: (a) the uncertainty about the presence (and composition) of peak biotite, thus precluding garnet-biotite thermometry and hindering determination of the thermal peak (see section 2.4.3.2); and (b) the apparent lack of plagioclase predating melt crystallization, thus precluding use of the GASP reaction to calculate the conditions at which reaction [R1] was crossed. However, an upper pressure limit on the conditions at which dehydration melting of micas was initiated may be set by the intersection of reaction [R1] with a GASP isopleth calculated with garnet from the Grs-enriched rims (i.e. garnet that started growing by reaction [R2]) and matrix plagioclase with the highest An content. This is based on the assumption that plagioclase in equilibrium with that garnet was more An-rich than plagioclase that crystallized from the melt (see section 2.4.3.3).

Intersection of reaction [R1] and GASP isopleths can also be used to determine the retrograde P-T conditions at which reaction [R2] ceased during cooling. This can be done by using garnet outer rims not in contact with the Grs-enriched areas and adjacent plagioclase rims. Additional constraints may be placed by using garnet X_{Fe} isopleths. In sample 100, relatively low X_{Fe} in garnet cores is likely to represent the thermal peak, whereas the intersection between reaction [R1] and the X_{Fe} isopleth of garnet rims away from biotite (to avoid effects of late Fe-Mg exchange between the two minerals) can be used to estimate the *P-T* conditions at which reaction [R2] ceased during cooling. Compositional parameters used for the calculations are given in Appendix 7.

Intersection of reaction [R1] with relevant GASP isopleths defines an upper *P* limit of 1390-1210 MPa at 780-760°C for the entry into the melt domain during the prograde evolution, and *P-T* conditions of 1100 MPa and 748°C for retrograde melt crystallization (Figure 4.8b). These conditions fall in the kyanite stability field, and imply no major decompression between the prograde and retrograde portion of the path. The X_{Fe} isopleths yield a peak temperature of 746°C and *P-T* conditions of 900 MPa and 723°C for melt crystallization which implies partial melting in a very restricted *P-T* range close to the sillimanite stability field and cooling at pressure conditions lower than those yielded by the GASP isopleths. As mentioned in section 2.4.3.3, the validity of using X_{Fe} isopleths in Fe-rich metapelites, such as the sample under consideration, is questionable (Indares and Dunning 2001), and as a result the *P-T* conditions yielded by the GASP isopleths are considered more reliable. Finally, lack of significant decompression between the two portions of the P-T path and the presence of retrograde muscovite indicates that the prograde white mica was likely muscovite instead of phengite, ruling out reaction [R1a] as a possible melting reaction for this rock.



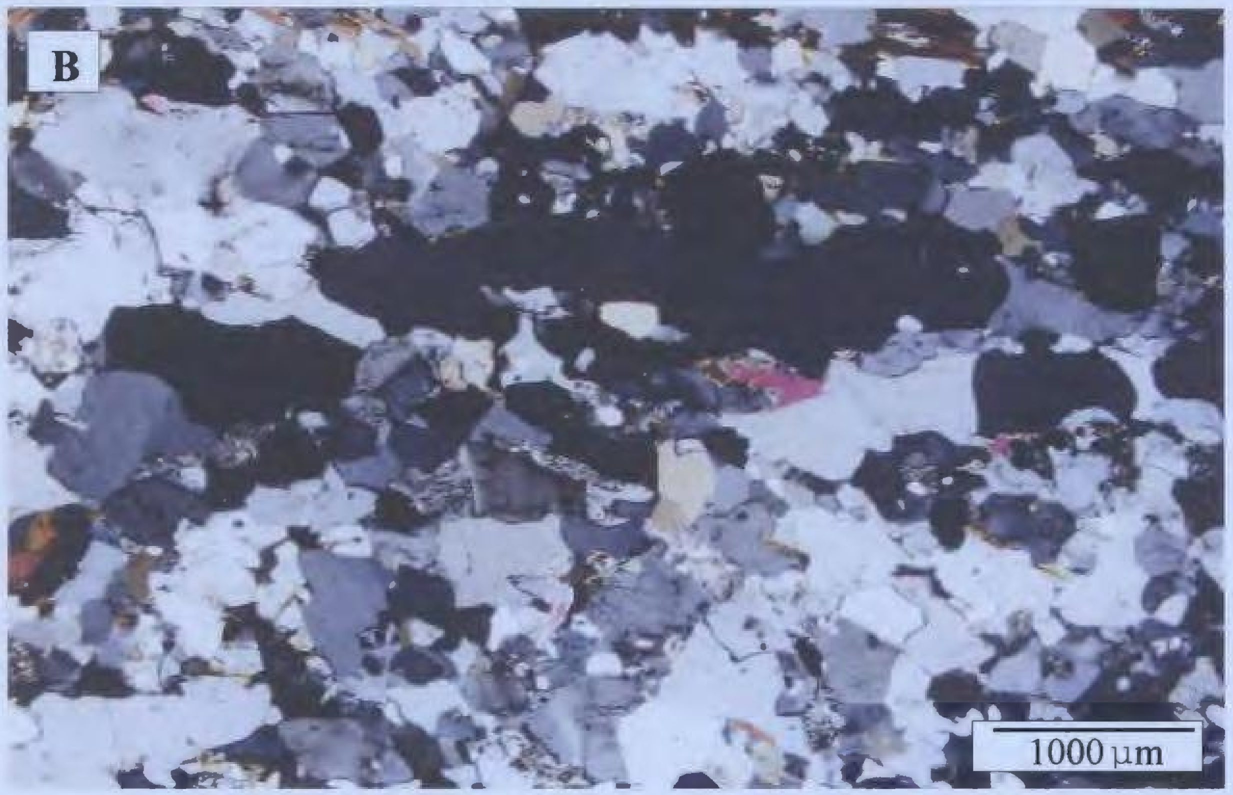


Plate 4.1: Coarse-grained areas dominated by quartz ribbons, probably representing restite (Sample 100). (A) plane polarized light and (B) cross polarized light.

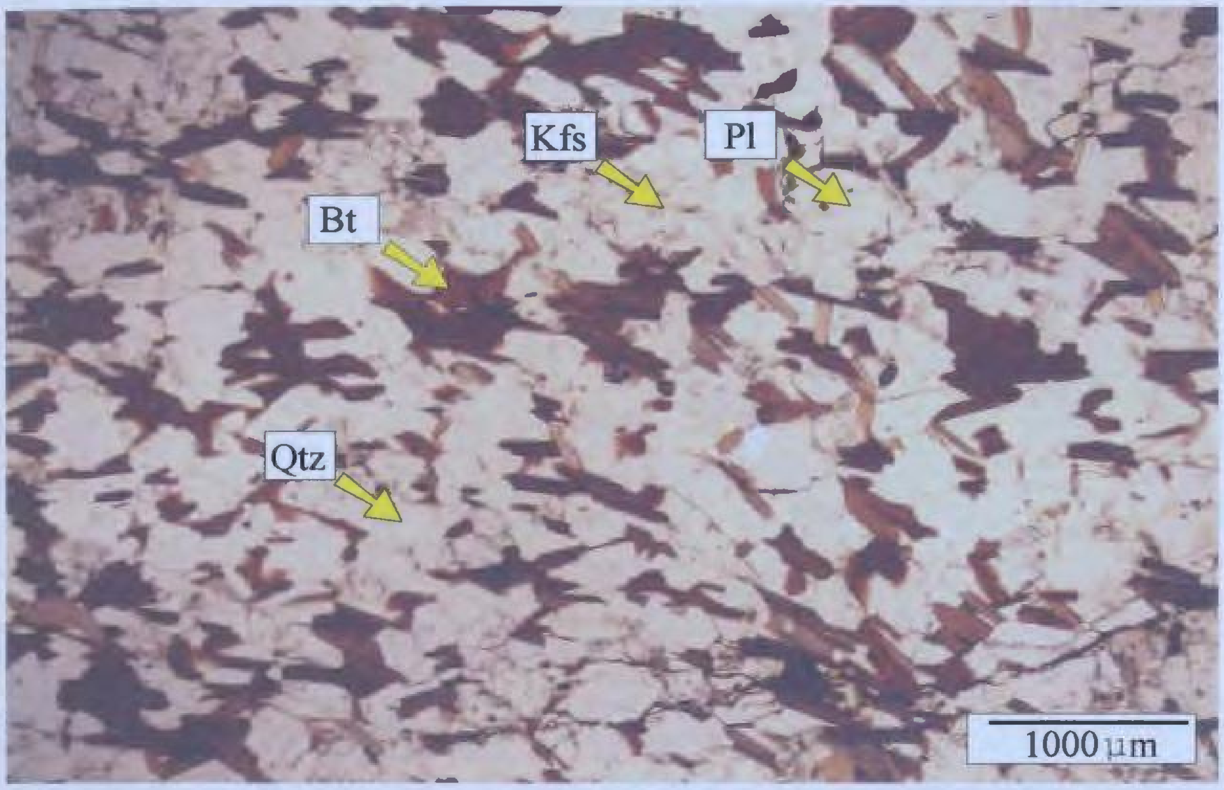


Plate 4.2: Close-up of a fine-grained layer consisting of biotite, quartz and subordinate K-feldspar representing leucosome (sample 100).

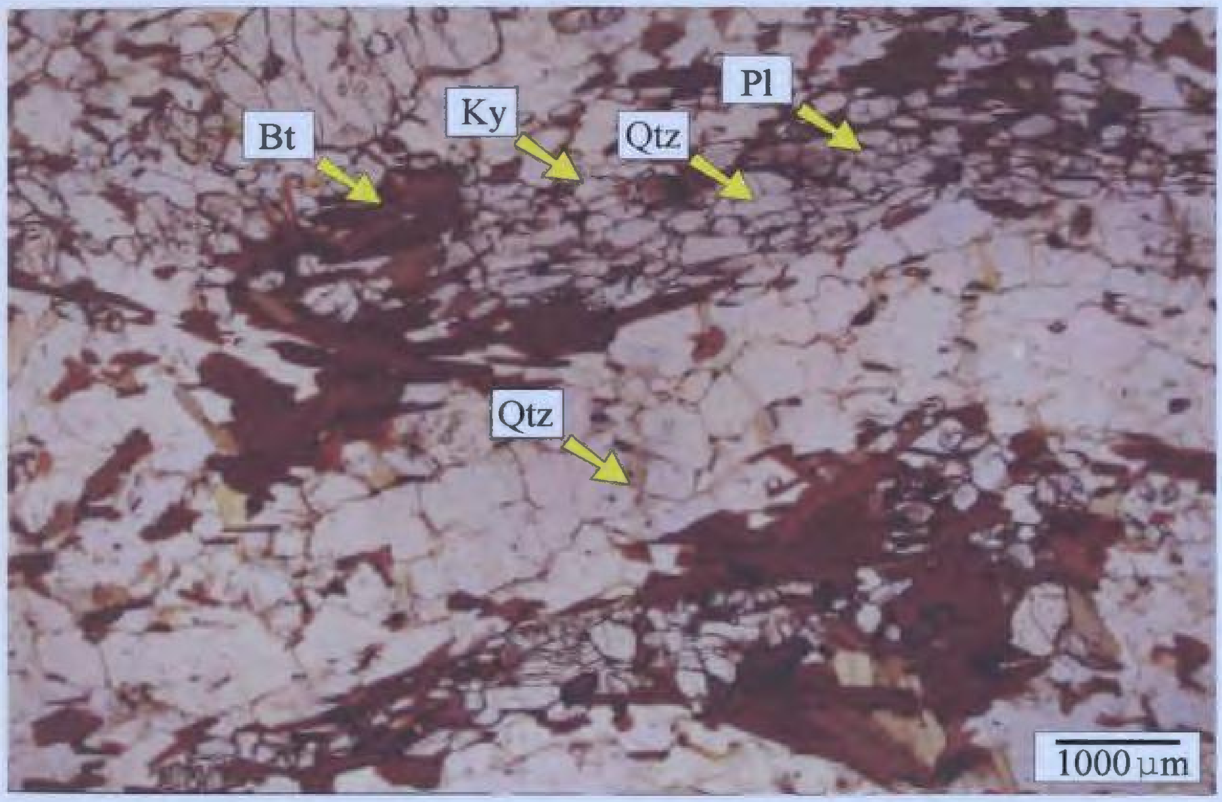


Plate 4.3: Fine-grained pods consisting of kyanite + biotite + plagioclase + quartz aggregates, which formed during melt crystallization, alternating with recrystallized quartz ribbons representing restite (sample 100).

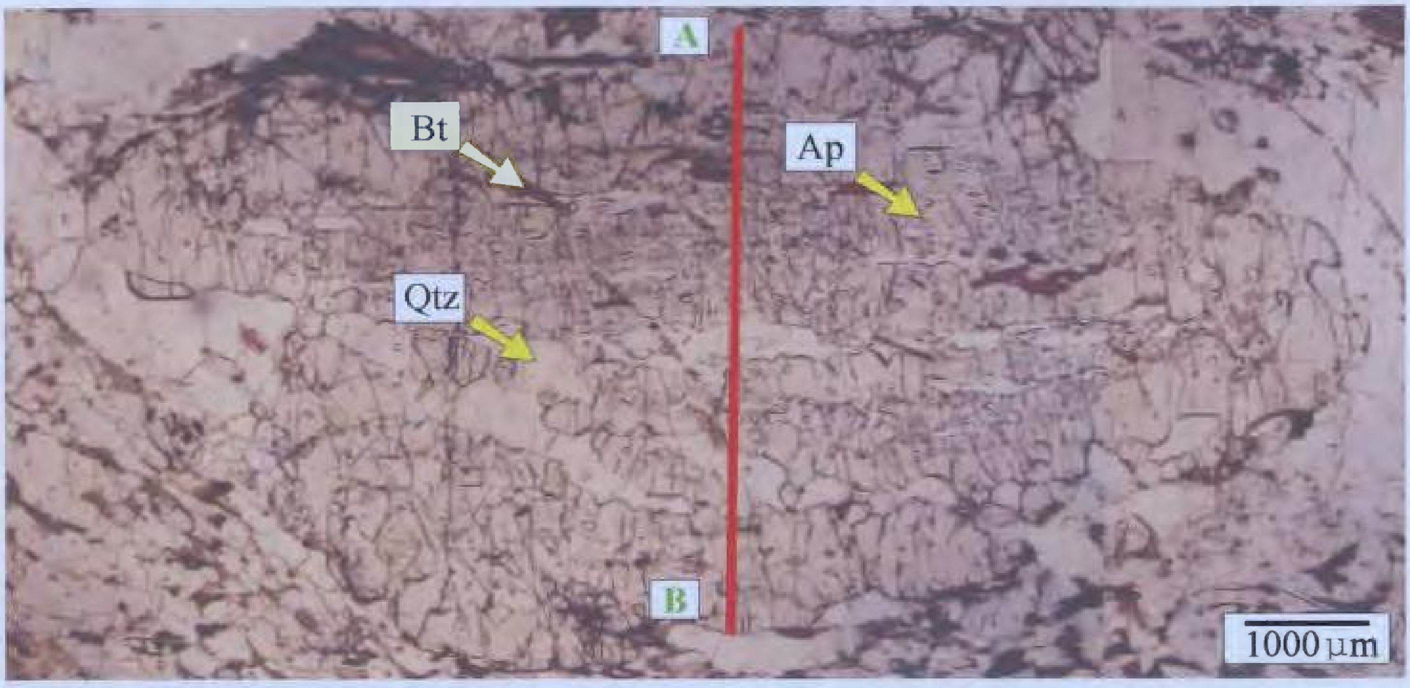


Plate 4.4: Garnet I from sample 100. Line A-B indicates the path of microprobe analysis (See Figure 4.1).

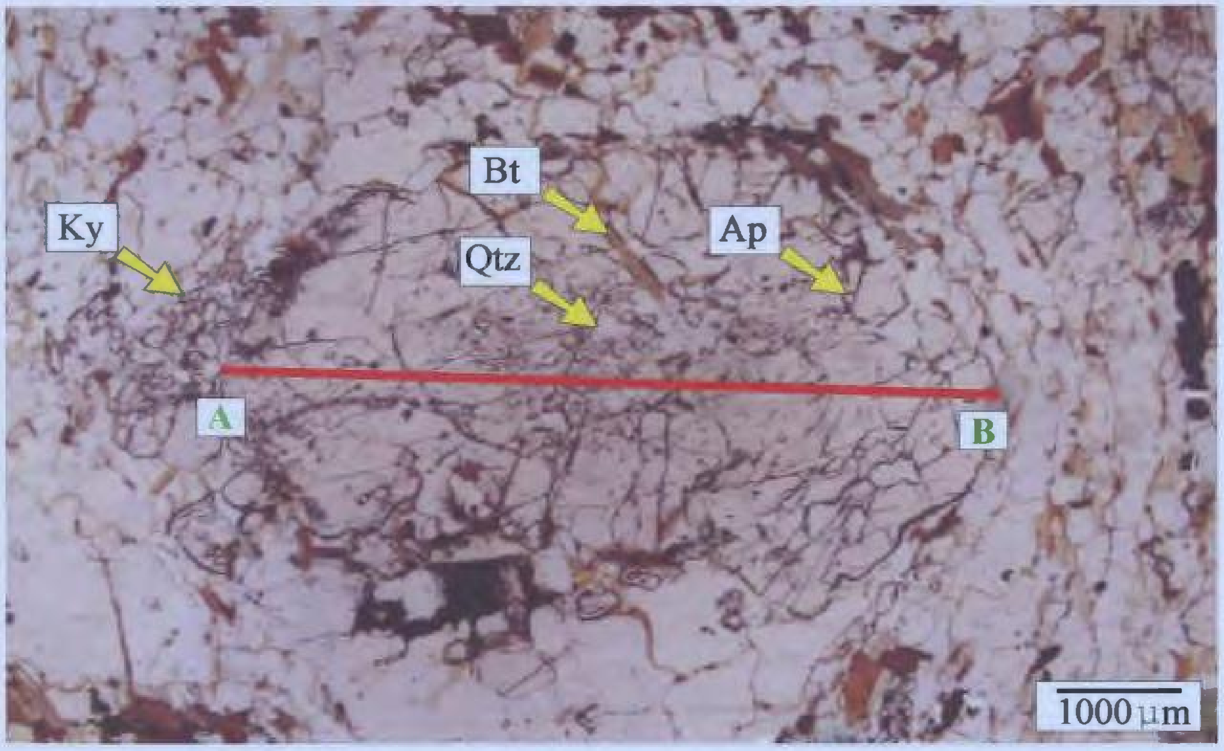


Plate 4.5: Garnet II from sample 100. Garnet is locally corroded by aggregates of kyanite + biotite + plagioclase + quartz. Line A-B indicates the path of microprobe analysis (See Figures 4.2 and 4.3).

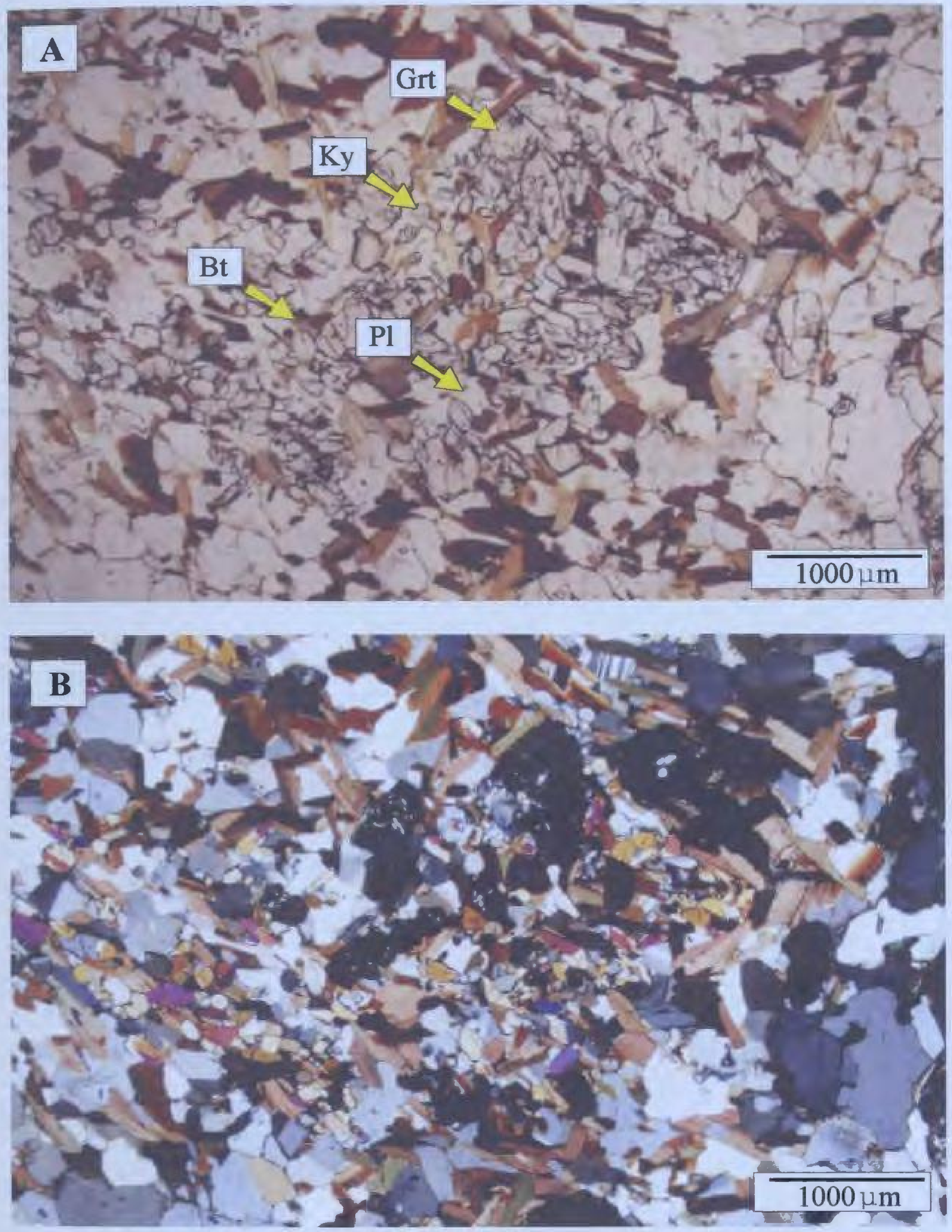


Plate 4.6: Garnet relic corroded by kyanite + biotite + plagioclase + quartz aggregates which probably formed during melt crystallization (sample 100). (A) plane polarized light and (B) cross polarized light.

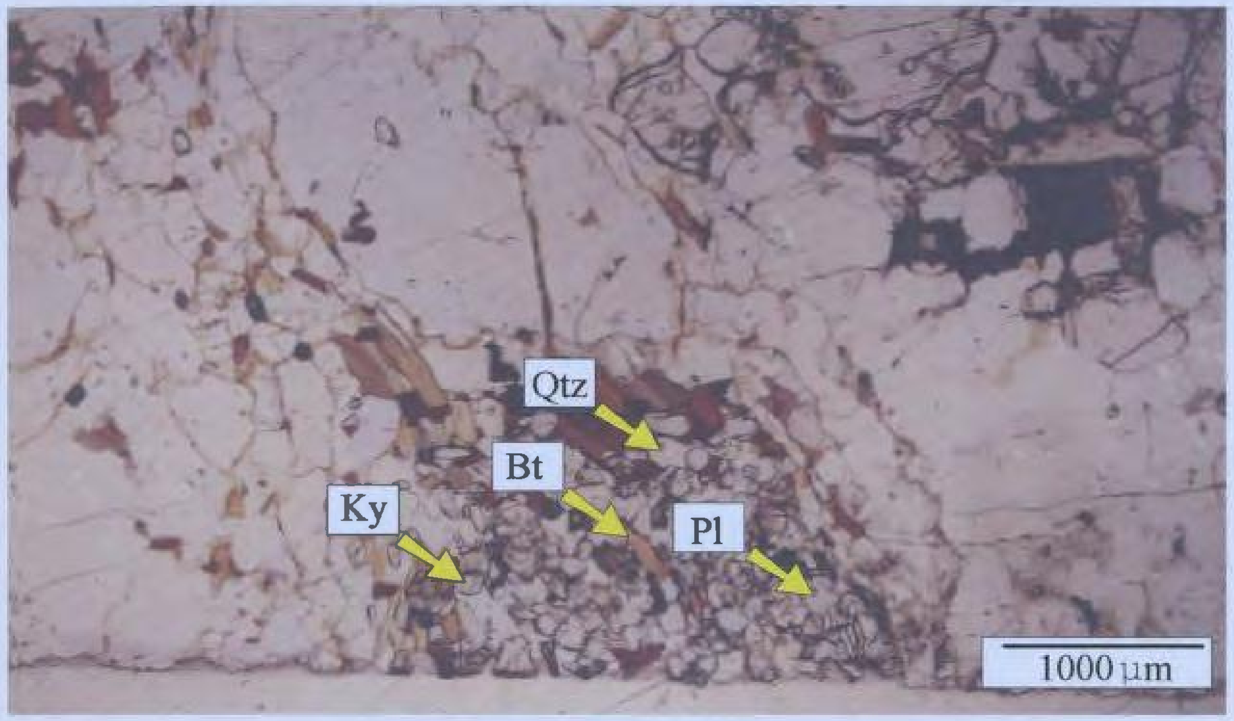
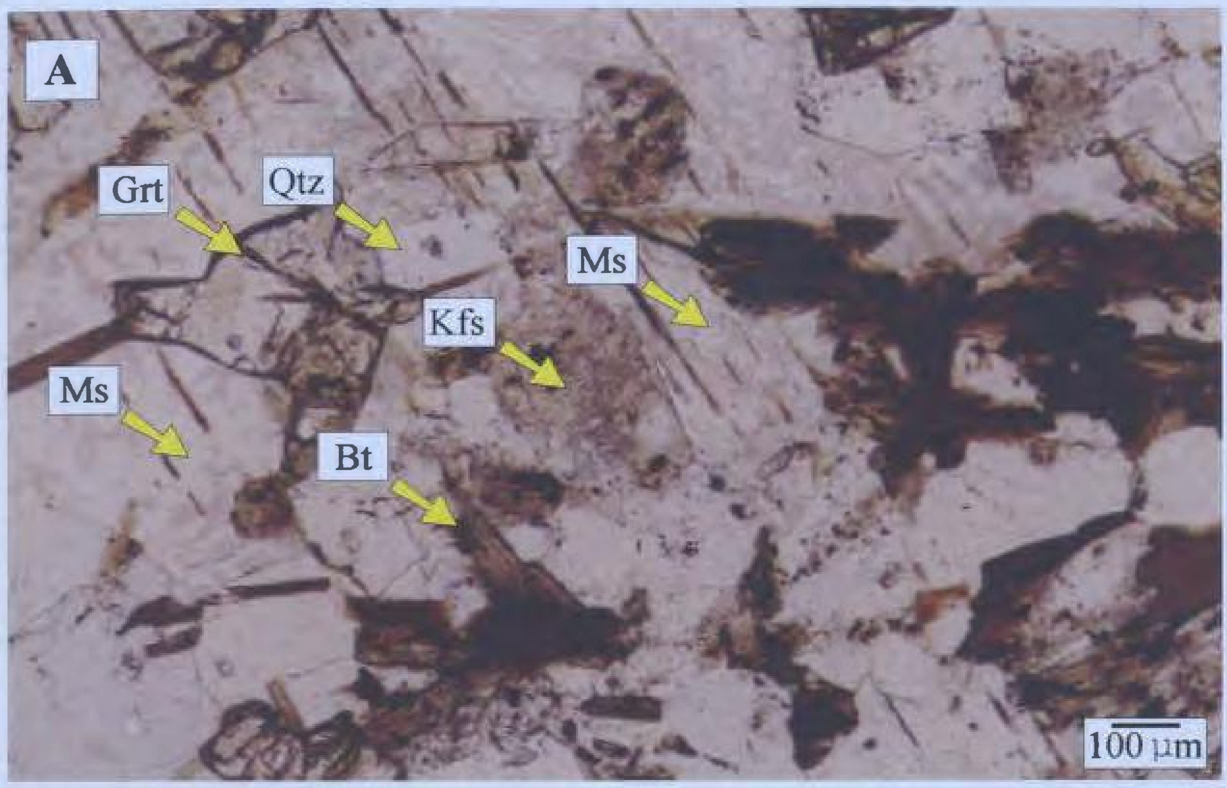


Plate 4.7: Inferred former garnet completely pseudomorphed by kyanite + biotite + plagioclase + quartz aggregate (sample 100).



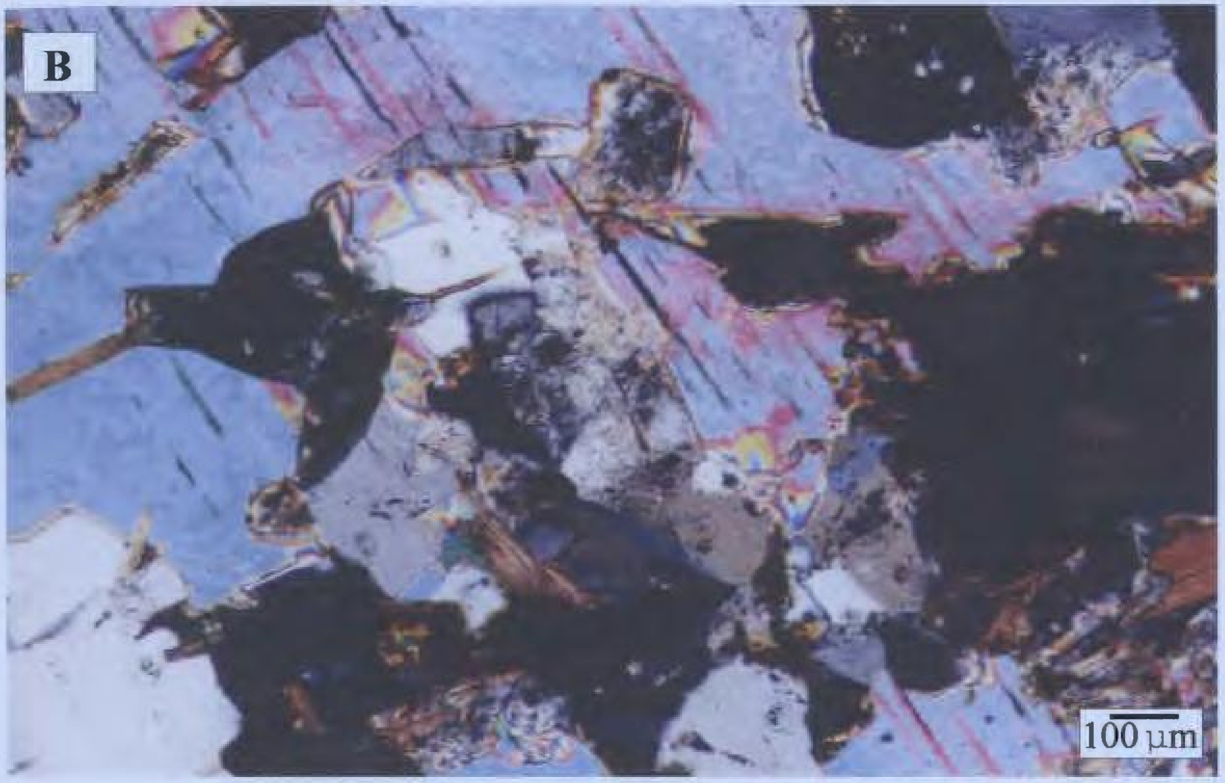


Plate 4.8: K-feldspar corroded by muscovite porphyroblasts (sample 100).
(A) plane polarized light and (B) cross polarized light.

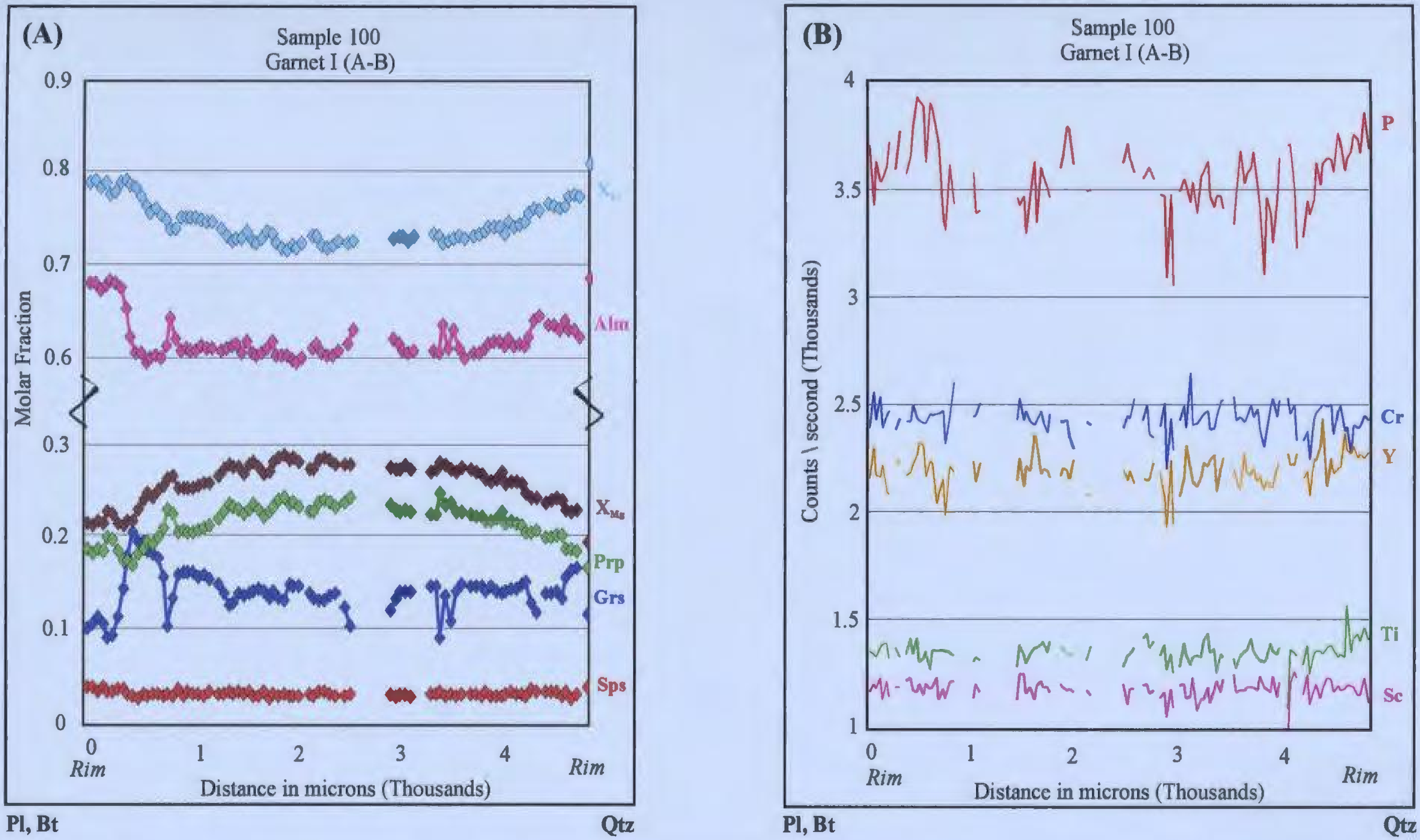


Figure 4.1: Zoning profiles of Garnet I from sample 100 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 4.4 for location of transect. Rim A is in contact with Pl and Bt; rim B is in contact with Qtz.

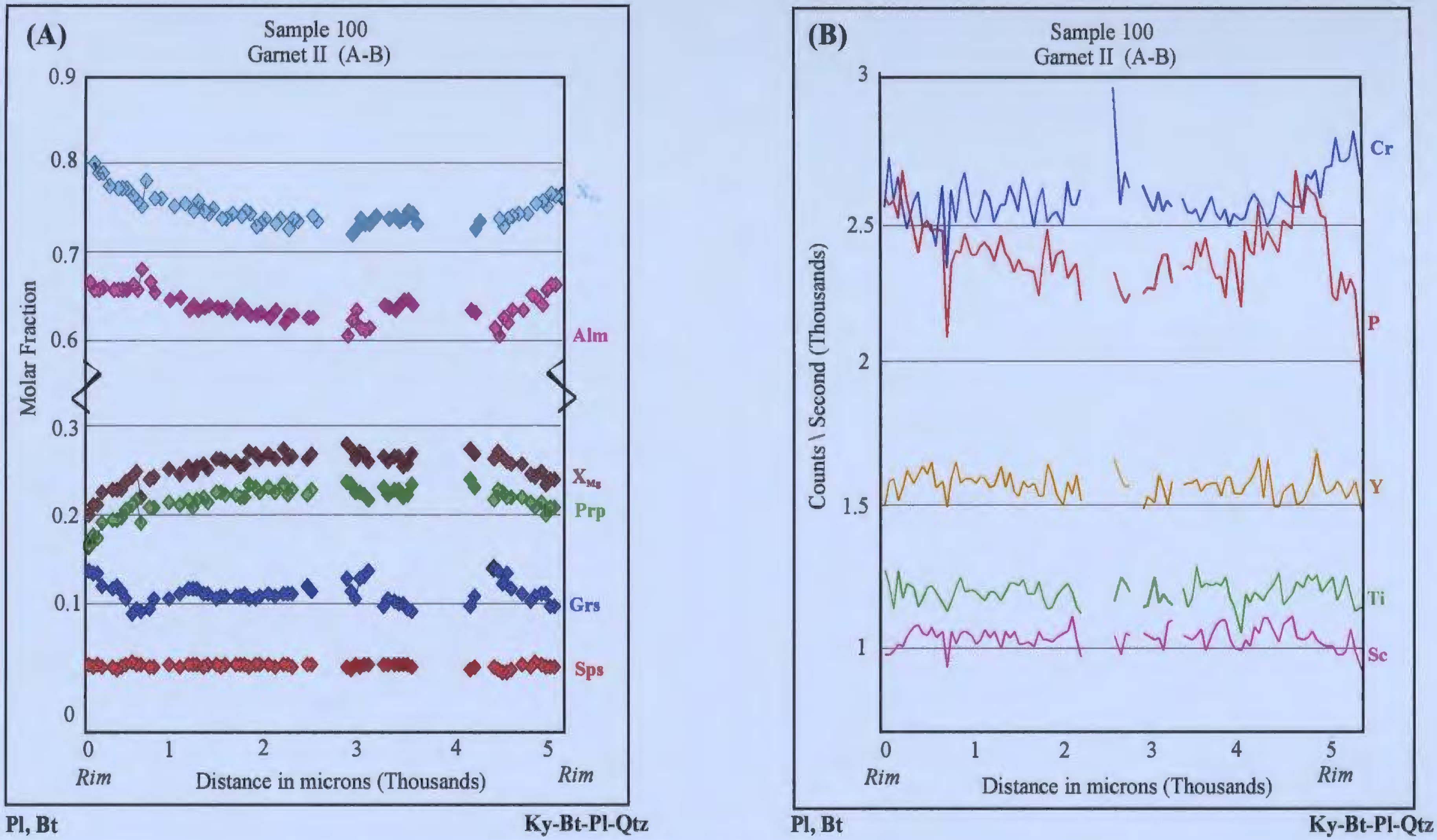


Figure 4.2: Zoning profiles of Garnet II from sample 100 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 4.5 for location of transect. Rim A is in contact with Pl and Bt; rim B is corroded by an aggregate of Ky + Bt + Pl + Qtz.

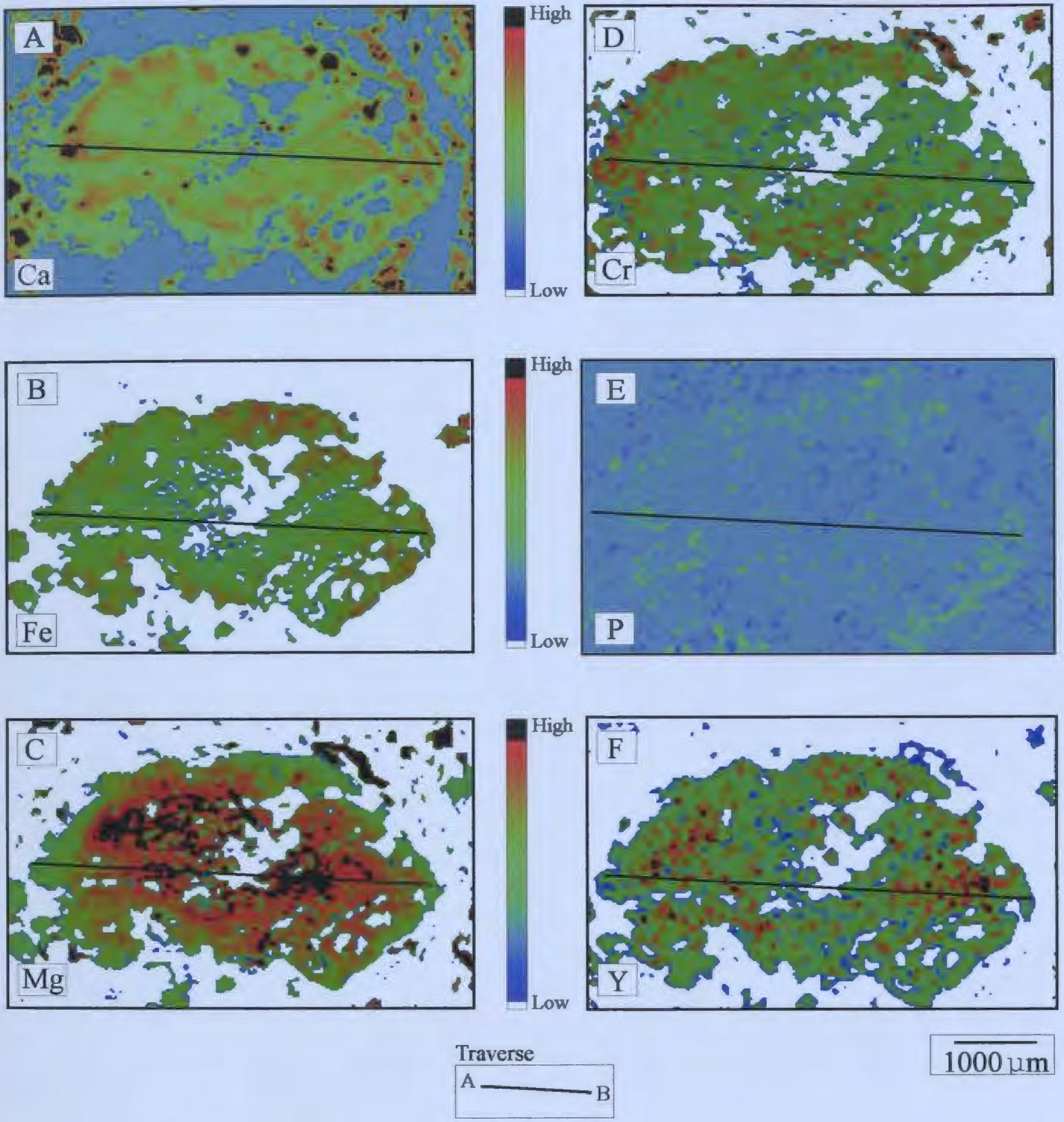


Figure 4.3: Compositional X-ray maps of Garnet II from sample 100 in terms of (A) Ca, (B) Fe, (C) Mg, (D) Cr, (E) P and (F) Y. The color scale indicates relative abundance of the element.

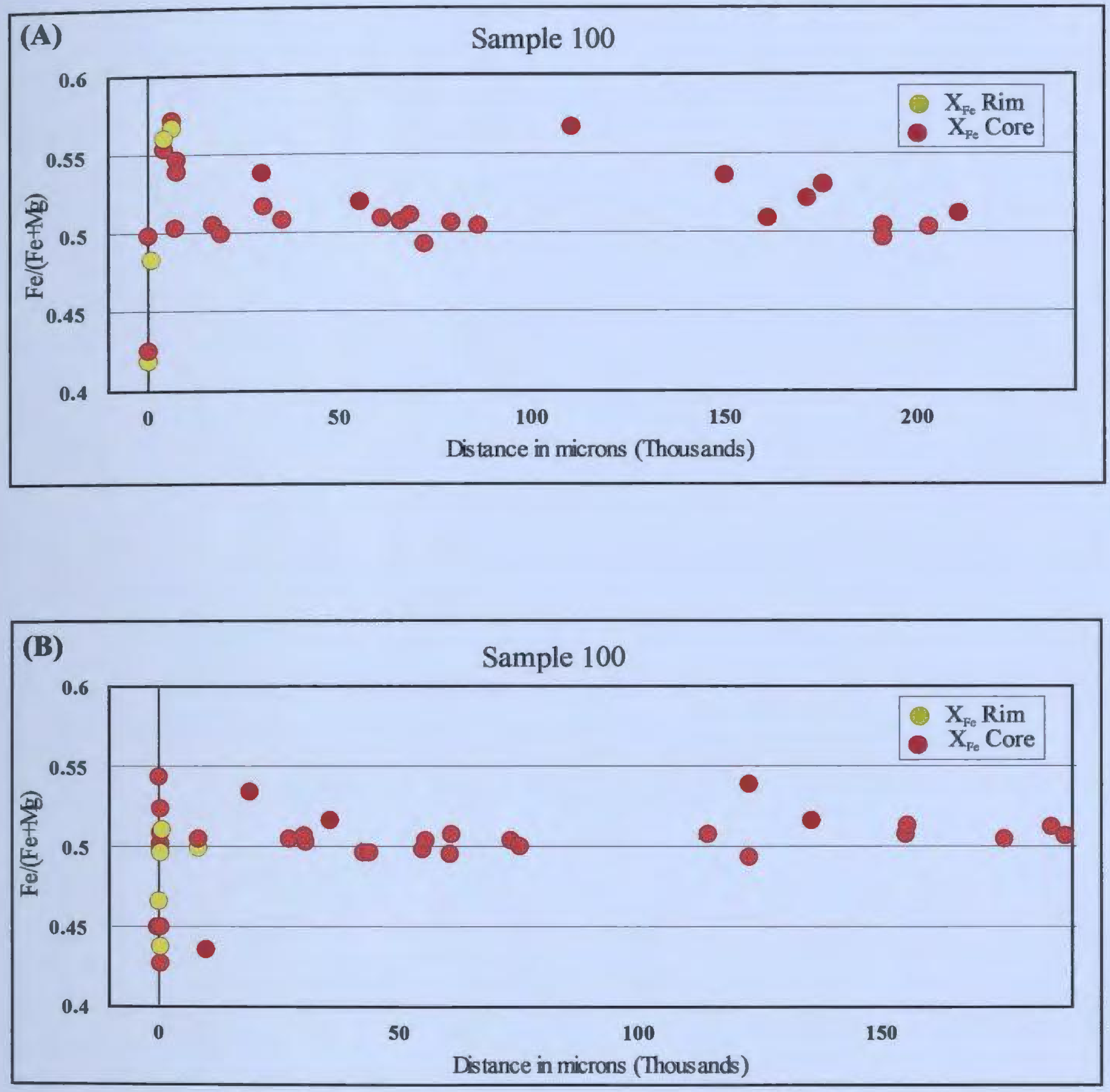


Figure 4.4: X_{Fe} biotite versus distance from (A) Garnet I and (B) Garnet II (sample 100).

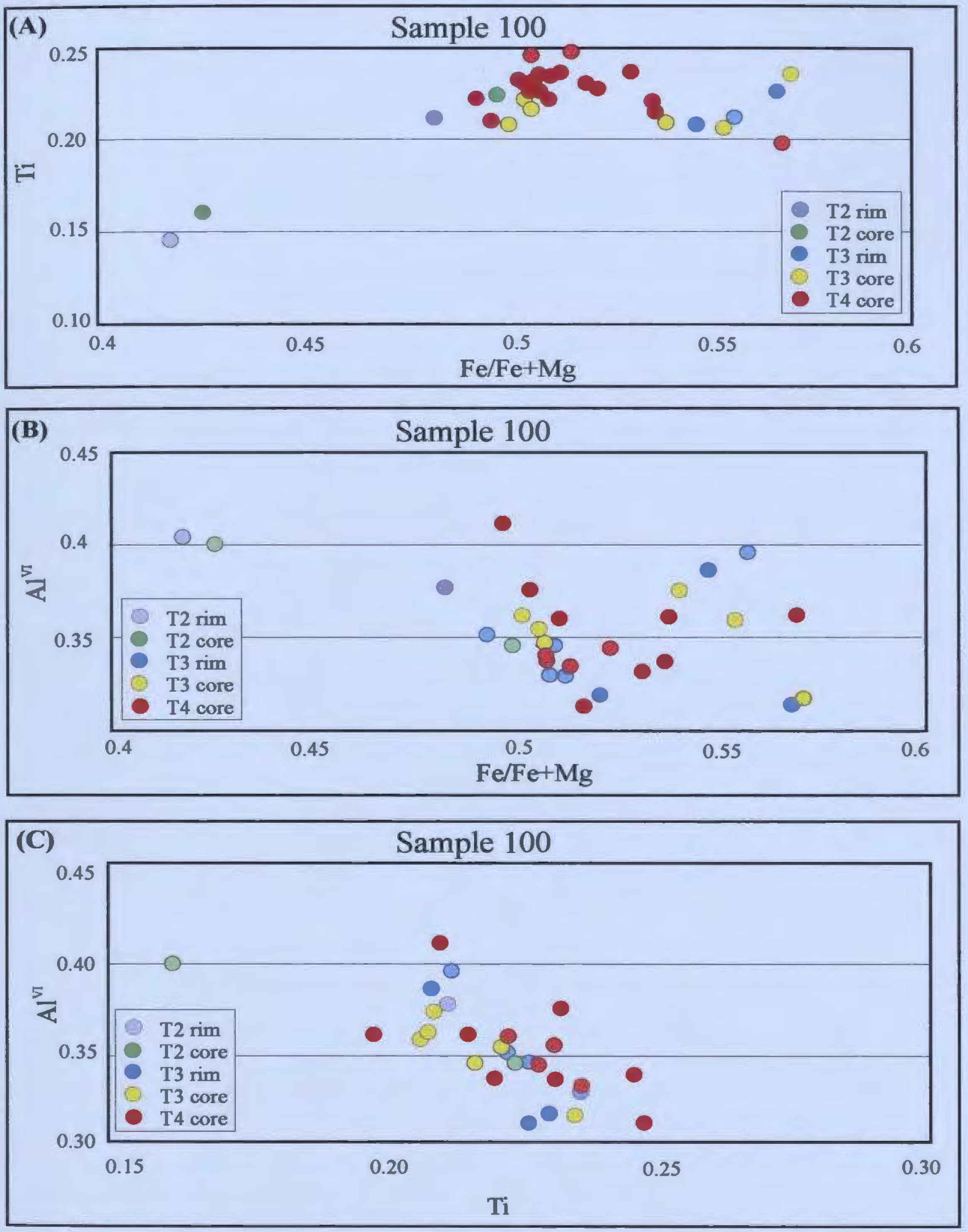


Figure 4.5: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet I.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet I.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite associated with Garnet I.
T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

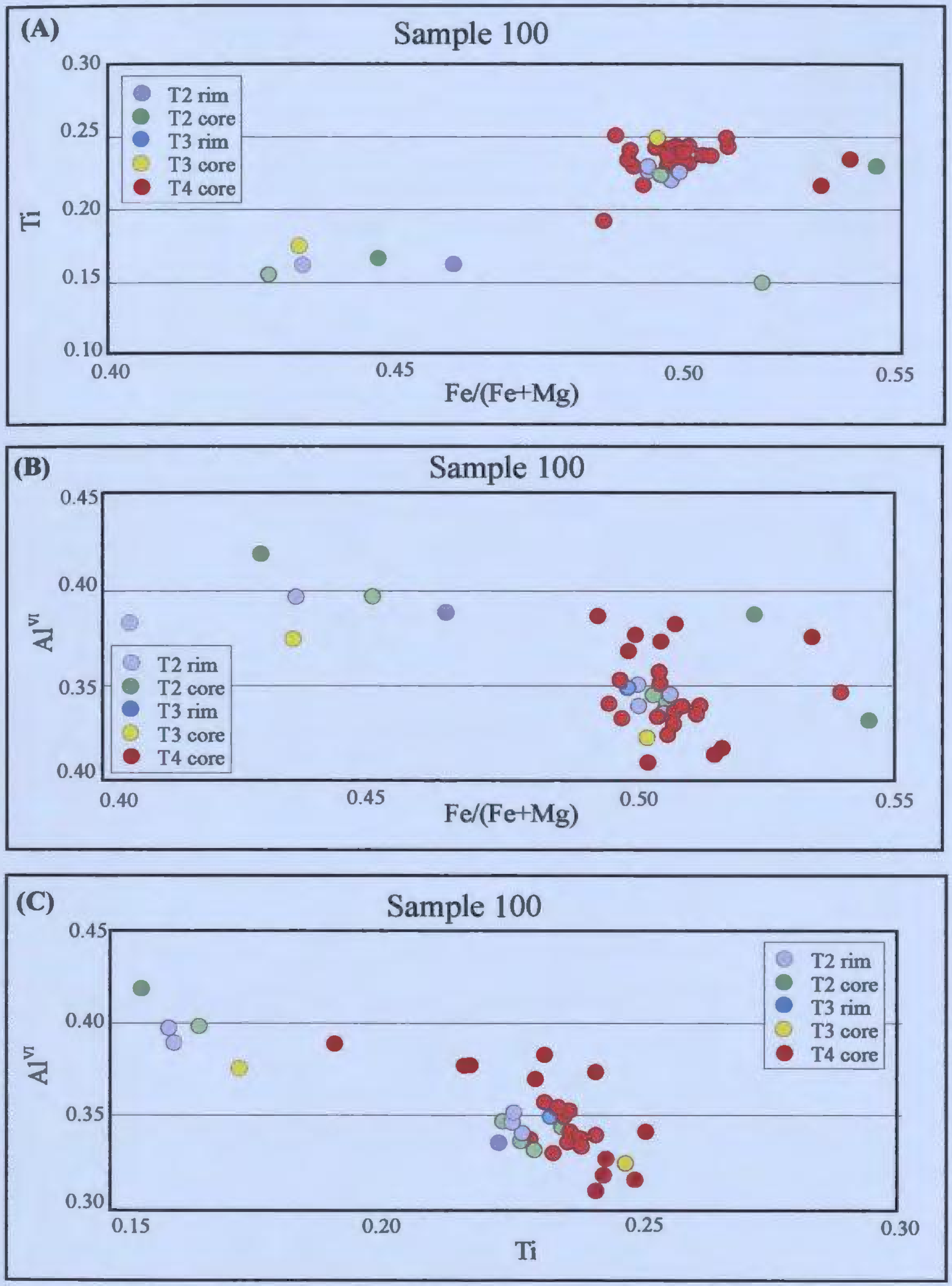


Figure 4.6: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet II.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet II.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite associated with Garnet II.
T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

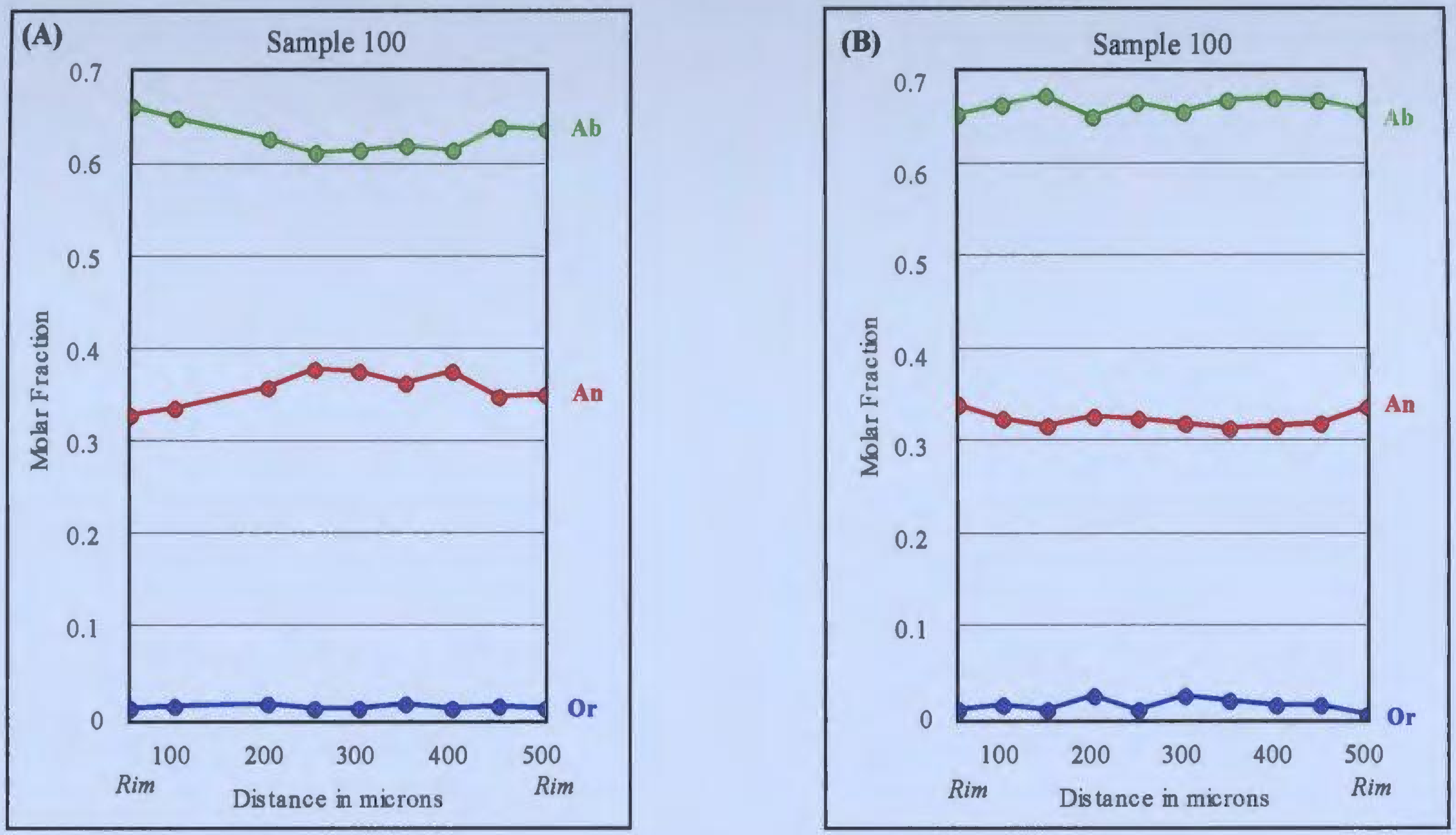


Figure 4.7: Zoning profiles in terms of molar fractions of An, Ab and Or across (A) a plagioclase grain isolated from garnet in the matrix (T4); and (B) a plagioclase grain adjacent to a garnet reaction zone.

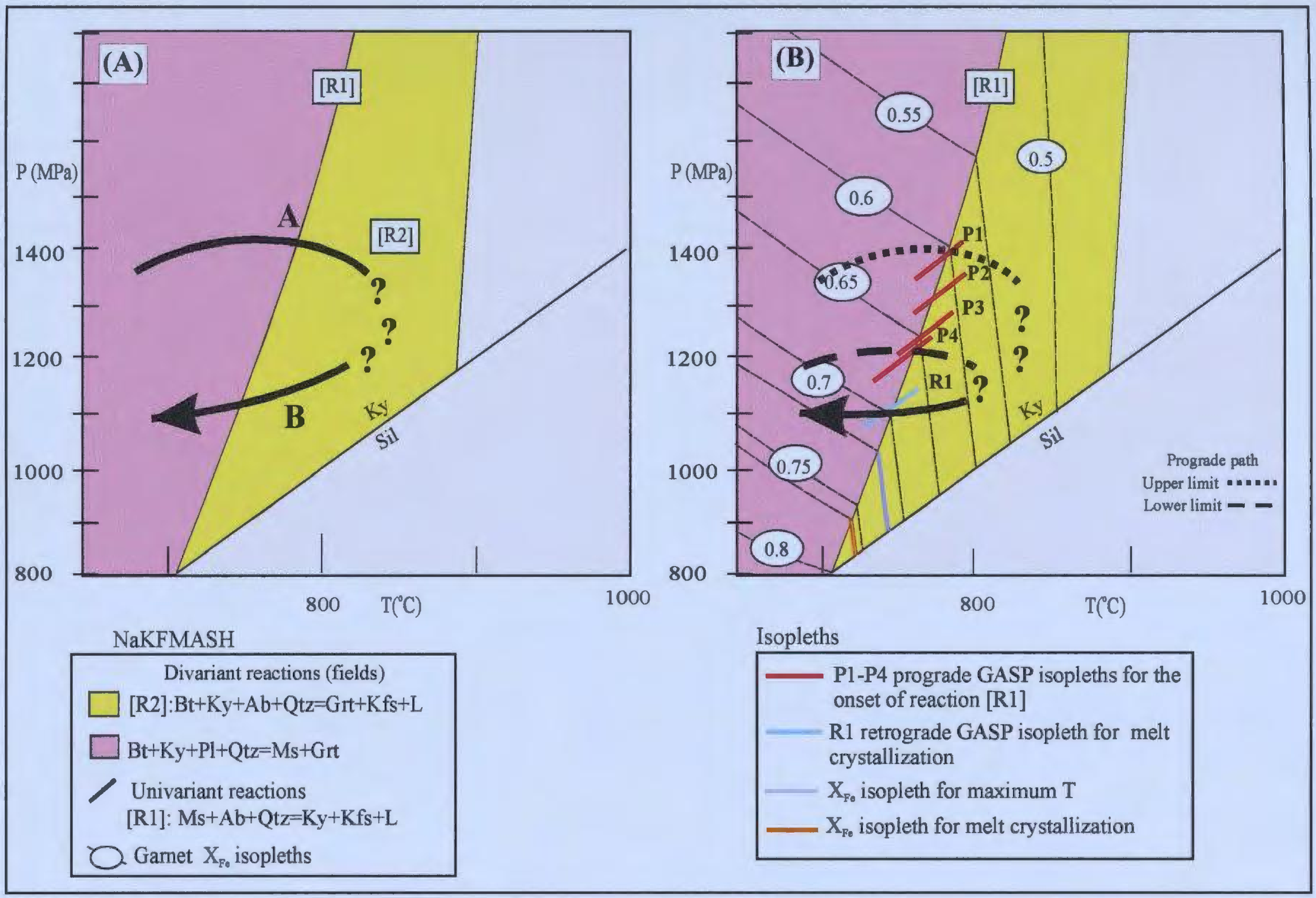


Figure 4.8: *P-T* diagram showing the locations of selected melting reactions in the kyanite field (NaKFMASH system) (modified after Spear et al. 1999); and the proposed *P-T* path for sample100. (A) qualitative *P-T* path deduced from textural interpretations (B) *P-T* path constrained by GASP isopleths. Also shown are selected X_{Fe} isopleths.

Table 4.1: Representative garnet analyses (Garnet I) from sample 100. See Tables 3.1a and 3.2a - Appendix 3 for complete data set.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Type	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	rim	31.70	4.80	3.64	1.67	21.71	37.53	0.00	101.06	2.09	0.56	0.31	0.11	2.01	2.95	0.00	8.04	0.68	0.18	0.10	0.04	0.79	0.21
2	rim	32.10	4.73	3.84	1.72	21.78	37.83	0.00	102.01	2.10	0.55	0.32	0.11	2.01	2.95	0.00	8.04	0.68	0.18	0.10	0.04	0.79	0.21
10	Ca peak	28.39	4.37	7.34	1.25	21.60	37.72	0.08	100.67	1.86	0.51	0.62	0.08	2.00	2.96	0.00	8.04	0.61	0.17	0.20	0.03	0.78	0.22
11	Ca peak	28.39	4.69	7.01	1.11	21.88	37.91	0.00	100.98	1.85	0.55	0.59	0.07	2.01	2.96	0.00	8.03	0.61	0.18	0.19	0.02	0.77	0.23
45	core	28.81	5.93	5.07	1.33	22.06	38.08	0.00	101.29	1.87	0.69	0.42	0.09	2.02	2.95	0.00	8.04	0.61	0.22	0.14	0.03	0.73	0.27
46	core	28.99	5.96	4.88	1.28	22.19	38.06	0.10	101.35	1.88	0.69	0.41	0.08	2.03	2.95	0.01	8.04	0.61	0.23	0.13	0.03	0.73	0.27

Table 4.2: Representative biotite analyses from sample 100 with 'r' representing a rim analysis and 'c' representing a core analysis. T2 = biotite in contact with garnet, T3 = biotite adjacent to garnet and T4 = biotite isolated from garnet in the matrix. See Table 4.1 - Appendix 4 for complete data set.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{VI}	Al^{IV}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
1r	2	9.48	36.03	18.75	16.77	10.80	0.10	2.85	94.68	0.91	2.72	1.28	0.39	1.06	1.22	0.01	0.16	7.74	0.47	0.53	0.43	0.37	0.14	0.06
1c	2	9.49	36.04	19.13	19.20	9.79	0.04	2.65	96.62	0.91	2.70	1.30	0.39	1.20	1.09	0.00	0.15	7.78	0.52	0.48	0.39	0.42	0.14	0.05
26c	3	9.76	35.29	18.09	17.33	9.57	0.03	4.32	94.35	0.95	2.69	1.31	0.32	1.11	1.09	0.00	0.25	7.72	0.50	0.50	0.39	0.40	0.12	0.09
26r	3	9.80	35.58	18.47	17.22	9.69	0.03	4.10	94.85	0.95	2.70	1.30	0.35	1.09	1.10	0.00	0.23	7.72	0.50	0.50	0.40	0.39	0.13	0.08
18c	4	9.36	35.51	19.41	17.42	9.54	0.12	4.30	95.80	0.89	2.66	1.34	0.37	1.09	1.07	0.01	0.24	7.69	0.51	0.49	0.38	0.39	0.13	0.09
20c	4	9.87	35.97	18.73	18.13	9.67	0.14	4.23	96.59	0.94	2.69	1.31	0.34	1.13	1.08	0.01	0.24	7.72	0.51	0.49	0.39	0.41	0.12	0.09

Table 4.3: Representative plagioclase analyses from sample 100 with 'r' representing a rim analysis and 'c' representing a core analysis. T1 = plagioclase included in garnet, T3 = plagioclase adjacent to garnet and T4 = plagioclase isolated from garnet in the matrix. See Table 5.1 - Appendix 5 for complete data set.

Grain # and Type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 1 T3	1	0	7.72	6.90	0.22	25.10	59.43	99.38	0.67	0.33	0.01	1.33	2.67	5.01	0.66	0.33	0.01
	2	50	7.49	7.00	0.25	25.35	59.04	99.14	0.65	0.34	0.01	1.34	2.66	5.01	0.65	0.34	0.01
	4	150	7.35	7.60	0.27	25.79	58.29	99.31	0.64	0.37	0.02	1.37	2.63	5.02	0.63	0.36	0.02
	5	200	6.91	7.70	0.19	25.54	57.70	98.04	0.61	0.38	0.01	1.37	2.63	5.00	0.61	0.38	0.01
	6	350	7.17	7.88	0.19	26.17	57.89	99.31	0.63	0.38	0.01	1.39	2.61	5.02	0.62	0.37	0.01
	7	300	7.15	7.59	0.28	26.24	59.22	100.48	0.62	0.36	0.02	1.37	2.63	5.00	0.62	0.36	0.02
	8	350	6.91	7.64	0.19	25.00	58.43	98.18	0.61	0.37	0.01	1.34	2.65	4.99	0.61	0.37	0.01
	9	400	7.33	7.19	0.25	25.48	58.27	98.53	0.64	0.35	0.01	1.36	2.64	5.01	0.64	0.35	0.01
	10	450	7.34	7.30	0.21	25.44	58.87	99.16	0.64	0.35	0.01	1.35	2.65	5.00	0.64	0.35	0.01
Grain 3 T4	1	0	7.47	7.00	0.16	24.73	59.09	98.46	0.66	0.34	0.01	1.32	2.67	5.00	0.65	0.34	0.01
	2	50	7.36	6.53	0.22	25.34	58.99	98.44	0.64	0.32	0.01	1.35	2.67	4.99	0.66	0.32	0.01
	3	100	7.51	6.37	0.16	24.79	59.36	98.20	0.66	0.31	0.01	1.32	2.69	4.99	0.67	0.32	0.01
	4	150	7.32	6.62	0.39	24.79	59.35	98.48	0.64	0.32	0.02	1.32	2.68	4.99	0.65	0.33	0.02
	5	200	7.52	6.63	0.17	25.15	59.30	98.78	0.66	0.32	0.01	1.34	2.67	4.99	0.67	0.32	0.01
	6	250	7.55	6.65	0.43	25.14	59.34	99.11	0.66	0.32	0.02	1.33	2.67	5.01	0.66	0.32	0.02
	7	300	7.90	6.72	0.33	25.10	59.73	99.78	0.68	0.32	0.02	1.32	2.67	5.02	0.67	0.31	0.02
	8	350	7.70	6.57	0.23	24.64	59.62	98.76	0.67	0.32	0.01	1.31	2.69	5.00	0.67	0.32	0.01
	9	400	7.64	6.58	0.26	24.69	59.05	98.21	0.67	0.32	0.02	1.32	2.68	5.01	0.67	0.32	0.01
Grain 7 T1	9c		7.49	7.67	0.00	25.55	58.82	99.53	0.65	0.37	0.00	1.35	2.64	5.01	0.64	0.36	0.00
	10r		7.41	7.81	0.27	25.69	58.44	100.07	0.64	0.38	0.02	1.36	2.62	5.03	0.62	0.36	0.01

Table 4.4: Representative muscovite analyses from sample 100 with 'r' indicating a rim analysis and 'c' representing a core analysis. See Table 6.1 - Appendix 6 for complete data set.

	Oxide percentage								Cations on an 11 (O) basis							
#	Na_2O	K_2O	SiO_2	Al_2O_3	FeO	MgO	TiO_2	Total	Na	K	Si	Al	Fe	Mg	Ti	Total
1c	0.28	7.72	47.42	35.29	1.40	0.97	1.26	94.35	0.04	0.65	3.12	2.74	0.08	0.10	0.06	6.79
1r	0.28	8.01	47.17	35.67	1.29	0.94	0.56	93.93	0.04	0.68	3.12	2.78	0.07	0.09	0.03	6.81
2c	0.09	8.30	47.49	36.00	1.23	0.83	0.18	93.84	0.01	0.70	3.14	2.81	0.07	0.08	0.01	6.80
2r	0.07	8.36	47.10	35.59	1.75	0.78	0.40	93.97	0.01	0.71	3.13	2.79	0.10	0.08	0.02	6.81

CHAPTER 5: PETROLOGY AND METAMORPHIC INTERPRETATION OF METAPELITE FROM THRUST SLICE #2

In common with the northernmost thrust slice (slice #1) described in Chapter 4, the central thrust slice (slice #2) in southwestern Gagnon terrane (Figure 1.1) contains kyanite-bearing metapelitic rocks with variable amounts of leucosomatic pods (Plate 1.1), quartzite and iron formation. Two representative kyanite-bearing samples 11E and 31A were selected for detailed study. Both samples have higher X_{Mg} (0.45-0.48) than sample 100 from slice #1. Sample 31A has the composition of a typical pelite (Table 2.1 - Appendix 2) whereas sample 11E (two specimens 11E1 and 11E2) has lower K (1.76 wt% K_2O) and higher Na (3.89-5.56 wt% Na_2O).

5.1 MINERALOGY AND TEXTURE

Both samples consist of quartz, biotite, plagioclase, kyanite, garnet, and minor K-feldspar. Sample 31A also contains abundant muscovite. Minor monazite and apatite occur in the matrix of sample 11E.

5.1.1 Sample 11E

Specimen 11E1 consists of weakly foliated discontinuous layers rich in kyanite, garnet and biotite (Plate 5.1) alternating with massive discontinuous, dominantly quartzofeldpathic layers (Plate 5.2). Specimen 11E2, on the other hand, is dominated by a large garnet porphyroblast (>1200 μm) (Garnet I, Plate 5.3) in a quartzofeldspathic matrix. Garnet also occurs as subidioblastic porphyroblasts up to 5000 μm in diameter in specimen 11E1 (Plate 5.4). In both specimens, garnet cores contain inclusions of biotite, quartz, plagioclase, monazite, apatite and rutile. These inclusions are concentrated along the short axis of the largest garnet porphyroblast of specimen 11E1 in a direction perpendicular to the foliation (Garnet II, Plate 5.3). Garnet rims, on the other hand, are mostly inclusion-free and variably overgrown by aggregates of fine-grained quartz, plagioclase and biotite (Plate 5.4).

The quartzofeldspathic layers of specimen 11E1 and the matrix of specimen 11E2 are mainly composed of plagioclase and quartz (Plate 5.2). Minor phases consist of K-feldspar variably altered to sericite, isolated grains and clusters of biotite and amorphous garnet relics. The alternating layers are dominated by biotite and blades of poikiloblastic kyanite with inclusions of quartz (Plate 5.5). Biotite locally rims garnet relics and kyanite, and systematically separates these two minerals. Monazite and apatite occur as small rounded grains (~50 μm) associated with biotite in the matrix.

5.1.2 Sample 31A

Sample 31A consists of fine-grained layers composed of quartz, biotite, garnet, and minor plagioclase, K-feldspar, and muscovite (Plate 5.6), and coarser-grained pods containing quartz and muscovite aggregates with inclusions of relict, amorphous garnet, kyanite and K-feldspar (Plates 5.7 and 5.8). Muscovite is locally associated with biotite and both phases define the foliation. Kyanite also occurs as porphyroblasts with quartz and biotite inclusions (Plate 5.9). K-feldspar is partly sericitized and locally corroded and replaced by muscovite and biotite.

Interpretation

The presence of kyanite and minor K-feldspar indicates that the temperature conditions for dehydration melting of white mica (Ms + Ab + Qtz = Kfs + Ky + L; [R1] or Phe + Ab + Qtz = Bt + Kfs + L; [R1a]; Figures 2.6 and 2.7) were exceeded and *P-T* conditions reached the field of biotite dehydration melting (Bt + Ky + Ab + Qtz = Grt + Kfs + L; [R2]; Figure 2.7). High Na_2O / low K_2O contents in sample 11E relative to those of typical pelites suggest that muscovite may have had a significant paragonite [$NaAl_3Si_3O_{10}(OH)_2$] component. If so, muscovite dehydration melting is expected to have started before the onset of reaction [R1] by the reaction Pg + Qtz = Ky + Ab + L, which would have progressively depleted muscovite of its paragonite component until reaction [R1] was reached (Spear et al. 1999).

Muscovite replacing kyanite and K-feldspar (Plate 5.7) is likely the result of reaction [R1] operating in the reverse sense during melt crystallization in the muscovite stability field. However, garnet relics in aggregates of muscovite (Plate 5.8) cannot be attributed to reaction [R1] because the latter does not involve garnet. This garnet is interpreted to have been resorbed during melt crystallization in the biotite field (reaction [R2] in the reverse sense) before the muscovite growth. Operation of reaction [R2] in the reverse sense during cooling is also suggested by local biotite overgrowths on garnet rims.

5.2 MINERAL COMPOSITIONS

5.2.1 Garnet

X-ray composition maps of garnet porphyroblasts (Table 1.1 - Appendix 1) were obtained from specimens 11E2 (Garnet I, Figure 5.1) and 11E1 (Garnet II, Figure 5.2). In addition, quantitative analyses along two rim-core-rim traverses were performed across each garnet porphyroblast (Figures 5.3 to 5.6, Tables 3.3 to 3.6 - Appendix 3) as well as across a relict grain included in muscovite (sample 31A ; Figure 5.7, Tables 3.7 and 3.8 - Appendix 3). The porphyroblasts have overlapping Sps, Alm and Prp compositions in the range of Sps_{1-3}, Alm_{57-71}, Prp_{25-35} (Table 5.1), but their Grs content differs (Garnet I - Grs_{4-8} and Garnet II - Grs_{1-3}; Figures 5.3a to 5.6a). The relict grain, on the other hand, is significantly richer in Sps and poorer in Prp (Grs_{7-8}, Alm_{64-65}, Prp_{15-16}, Sps_{12-15}) (Figure 5.7; Table 5.1) relative to the porphyroblasts.

The core of Garnet I (specimen 11E2) displays an outward increase in Prp and a corresponding decrease in Alm. However, this zoning is not symmetrical and the Prp depleted area constitutes an elongate zone that occupies one side of the grain (Figure 5.1c). In contrast, the outer rims display a slight concentric decrease in Prp and increase in Alm (Figures 5.1, 5.3 and 5.4). Grs, on the hand, is relatively homogeneous in the core (Figure 5.1a) with the exception of higher contents away from the inclusion-rich areas and local decreases in the outer rims (Figure 5.3a and 5.4a). Sps displays a slight outward decrease with this trend being reversed at the outer rims (Figure 5.3a and 5.4a).

Garnet II (specimen 11E1) is characterized by: (a) relatively homogeneous Prp and Alm contents in the core, with Prp progressively decreasing and Alm increasing at the rims (Figure 5.2b and 5.2c); and (b) patchy areas enriched in Grs along the two inclusion-free zones parallel to the short axis of the grain (Figure 5.2a). Sps, on the other hand, is homogeneous across the entire grain (Figures 5.5a and 5.6a). The relict garnet (sample 31A) is homogeneous except for an increase in Sps and Alm towards the rims which is compensated by a decrease in Pyp as reflected in the X_{Fe} (Figures 5.7a and 5.7b).

Notable trace element trends in the garnet porphyroblasts (sample 11E) include: (a) a slight outward increase in Sc (Figures 5.3b to 5.6b); (b) variable outward P increase in Garnet I (Figure 5.3b and 5.4b) and P zoning roughly correlative with Grs zoning in Garnet II (Figure 5.5b and 5.6b); (c) patchy Cr-enrichment in Garnet II which is not correlative with the Grs-enriched zones (Figures 5.5b and 5.6b); and (d) slight Y-enrichment in the Prp-poor zone in Garnet I (Figures 5.3b and 5.4b). Local peaks in Ti (Garnet I) are attributed to Ti-rich inclusions.

Interpretation

As previously mentioned, garnet porphyroblasts from sample 11E consist of an inclusion-rich core surrounded by an inclusion-free rim (Plates 5.3 and 5.4). Growth zoning in terms of Prp, Alm and Sps is preserved, to some extent, in the core of Garnet I only (Figure 5.3a and 5.4a), whereas both garnets preserve Grs growth zoning with Grs troughs in the high-Prp areas of Garnet I (Figure 5.3a and 5.4a) and Grs-enriched bands in Garnet II (Figure 5.5a and 5.6a). In both garnets, zoning occurs in bands. In the case of Garnet II, these bands are parallel to the foliation and to the inclusion-rich short axis of the grain. The significance of this zoning observed in the two garnets is not well understood; however, the distribution of the different bands parallel to the foliation in the case of Garnet II (Figure 5.2a) indicates that element diffusion promoting growth may have been facilitated in this direction. The same may hold for Garnet I, but the relationship of this garnet with the matrix is not well displayed because of its large size with respect to the thin section. It is also possible that the zoning pattern of Garnet I may be attributed to overprinting of an existing element distribution in a precursor layer (Yang and Rivers 2000).

Grs increase outwards from the troughs in Garnet I (Figure 5.3a) and Grs-enriched bands near the rims of Garnet II (Figure 5.2a) (with some also enriched in Cr) are consistent with growth of the rims, at least to some extent, by the continuous biotite dehydration melting reaction ([R2], Figure 2.7). Along the same lines, P-enrichment in the same areas (Figure 5.3b and 5.5b) may be attributed to breakdown of apatite and/or monazite whereas the area depleted in Prp and enriched in Y in Garnet I (Figure 5.3) may be viewed as demarcating an earlier garnet formed by subsolidus reactions. If these interpretations are correct, a significant portion of these garnets would have grown in the presence of melt. However, Grs zonation is weak and does not display sharp gradients. While this may be attributed to the overall low Grs content, it suggests that the above interpretation should be viewed with caution.

Prp decrease/Alm increase in all outer rims (Figures 5.3a to 5.7a) is consistent with retrograde diffusion-controlled zoning promoted by Fe-Mg exchange between garnet and biotite. Local increase in Sps (Figures 5.3a, 5.4a and 5.7) indicates that garnet has been variably resorbed, as would be expected if reaction [R2] (Figure 2.7) operated in the reverse sense during cooling. This is further supported by a sharp drop in Grs content in some rims and corrosion of garnet rims by biotite. Finally, high Sps contents in garnet from sample 31A (Table 5.1) may indicate advanced garnet breakdown consistent with textural evidence (Plate 5.8).

5.2.2 Biotite

In each specimen, the compositions of biotite analyzed at different distances (Table 1.1 - Appendix 1) from garnet overlap (specimen 11E1; $X_{Fe} = 0.31\text{-}0.39$, Ti = 0.13-0.21 p.f.u., $Al^{VI} = 0.31\text{-}0.44$ p.f.u; specimen 11E2: $X_{Fe} = 0.29\text{-}0.41$, Ti = 0.10-0.20 p.f.u., $Al^{VI} = 0.23\text{-}0.39$ p.f.u, Table 5.2, Tables 4.2 and 4.3 - Appendix 4, Figures 5.8, 5.9, 5.10). Grains adjacent to garnet are on average lower in X_{Fe} (Figure 5.8) and Ti than matrix grains away from garnet, with the exception of the core of a grain adjacent to Garnet I (specimen 11E2) that has a markedly higher X_{Fe} than the rest ($X_{Fe} = 0.41$, Figure 5.8a). Finally, there is an inverse correlation between Ti and Al^{VI} (Figure 5.9c and 5.10c).

Relatively low X_{Fe} in some biotite grains adjacent to garnet is consistent with retrograde Fe-Mg exchange between these two minerals. In addition, weak X_{Fe} gradients with increasing distance from garnet suggests that even matrix biotite may have been affected by retrograde diffusion to some extent. High X_{Fe} in one grain adjacent to Garnet

I (Figure 5.8a) is consistent with production of retrograde biotite after garnet (see section 2.4.3.2). The latter is supported by an increase in Sps in most garnet rims and it is likely that all biotite adjacent to garnet has been produced during retrogression. In this case, the scarcity of high X_{Fe} values in these biotite may be attributed to continuation of Fe-Mg exchange between garnet and biotite at temperatures below the blocking of the new transfer reactions (see section 2.4.3.2). Finally, higher Ti contents in matrix biotite indicates that these grains were formed under higher temperature conditions than the grains adjacent to garnet. However, it is not clear whether matrix biotite was stable at the thermal peak or was produced during retrogression.

5.2.3 Plagioclase

Plagioclase was only analysed in sample 11E (Table 1.1 - Appendix 1) due to the scarcity and small size of plagioclase in sample 31A. In both specimens 11E1 and 11E2 plagioclase is An-poor (11E1: An = 5-11%; 11E2: An = 5-24%, Table 5.3, Tables 5.2 and 5.3 - Appendix 5). In specimen 11E1, plagioclase is chemically homogeneous with grains included in garnet being more An-rich (10-11%) than matrix grains (5-9%). In specimen 11E2, composition of the different textural types of plagioclase overlap. Individual grains display an outward increase in An (Figure 5.11a) with the exception of one grain which shows a drop in An at the contact with garnet (21→5%) (Figure 5.11b).

Higher An contents in plagioclase included in Garnet II (specimen 11E1) are consistent with progressive depletion of An during garnet growth. The inverse zoning of plagioclase in specimen 11E2, together with a decrease in Grs in some outer rims is consistent with retrograde breakdown of Grs to form An.

5.2.4 Muscovite

The muscovite analysed from sample 31A (Table 1.1 - Appendix 1) has a composition close to that of ideal muscovite, with very minor Na and only subordinate Fe and Mg contents and a slight Si excess (Table 5.4, Table 6.2 - Appendix 6) over the ideal Si content. This suggests the presence of only a minor paragonite component and limited celadonite substitution which would be responsible for the formation of phengite.

5.3 SUMMARY AND *P-T* CONSTRAINTS

5.3.1 Summary

Samples 11E and sample 31A from thrust slice #2 (Figure 1.2) display features consistent with dehydration melting of white mica by reactions such as Ms + Qtz + Ab = Kfs + Ky + L ([R1]), or Phe + (Ab) + Qtz = Bt + Ky + Kfs + L ([R1a]) and of biotite by the reaction Bt + Ky + Qtz + Ab = Grt + Kfs + L ([R2]; Figure 5.12).

(1) Mineral assemblage

The absence of primary white mica and the presence of kyanite and K-feldspar indicates that the temperature conditions for reaction [R1] (or [R1a]) were exceeded and P-T conditions reached the field of biotite melting by reaction [R2] (Figure 5.12a - segment A). In addition, the low K and high Na contents of sample 11E suggests that the original white mica may have had a significant paragonite component, resulting in progressive dehydration melting of that component by the reaction: Pg + Qtz = Ky + Ab + L (Spear et al. 1999) until reaction [R1] or [R1a] was met. While leucosomatic pods were noted in the sampled area in the field, domains that could represent former melt pods were not recognized in the studied samples from slice #2. This may be due to melt escape (in the case of sample 11E which is low in K_2O) or to extensive recrystallization during cooling. Large quartz grains likely representing solid residue were, however, identified in the samples.

(2) Garnet zoning

In sample 11E, the zoning patterns of garnet porphyroblasts (together with the distribution of inclusions in case of Garnet II) suggests that growth was not concentric, but occurred preferentially along specific orientations. In both analyzed porphyroblasts, the parts which grew the latest are slightly enriched in Grs (away from the inclusion-rich zone in the case of Garnet II and away from the Grs troughs in the case of Garnet I), consistent with growth by reaction [R2] (see section 2.4.2). However, in both cases Grs gradients are very smooth, and the Grs-enriched areas in question only locally display Cr-enrichment (which would further support reaction [R2]). Therefore, a potential link between biotite dehydration melting and garnet growth is not as firmly established as for sample 100 in thrust slice #1.

In addition, the following textural features are related to melt crystallization: (i) biotite replacing garnet, and (ii) the pattern of retrograde zoning in the rims of the garnet porphyroblasts (sample 11E). These features together with high Sps contents in relict garnet (sample 31A), are consistent with retrograde biotite production after garnet, as for instance, by reaction [R2] operating in the reverse sense.

In conclusion, the evidence for reaction [R2] in the samples from thrust slice #2 is mainly provided by the mineral assemblages since garnet zoning is not diagnostic. The extent to which reaction [R2] occurred, however, cannot be established from textural analysis because of subsequent recrystallization and deformation. The *P-T* history subsequently followed a retrograde path with melt crystallization starting in the field of reaction [R2], again in the stability field of kyanite, and ending in the muscovite stability field.

5.3.2 Further *P-T* Constraints

Application of thermobarometry in samples from slice #2 is hampered by: (a) extensive disequilibrium textures associated with melt crystallization in sample 31A; and (b) relative textural and chemical homogeneity that may have been achieved during melt crystallization in sample 11E. In sample 11E it is unclear at which stage of the metamorphic evolution matrix metamorphic minerals grew (with the exception of phases overgrowing garnet) and the extent of garnet that may have formed by reaction [R2] is not well constrained.

However, assuming that the Grs-enriched zones in the porphyroblasts of sample 11E are due to growth by reaction [R2] and that Prp and Alm contents in garnet cores represent peak conditions, GASP and X_{Fe} - garnet isopleths can be calculated in an attempt to roughly constrain the *P-T* evolution. GASP isopleths were calculated in specimen 11E1 with: (a) maximum Grs in the Ca-enriched zones and plagioclase with maximum An in the matrix; and (b) adjacent garnet-plagioclase rims (Table 7.1 -

Appendix 7). Intersection of the first type of isopleth with reaction [R1] may provide some constraint on the *P-T* conditions of dehydration melting during the prograde path. Since following completion of white mica dehydration melting by reaction [R1], plagioclase is expected to be particularly An-rich (see section 2.4.2) and such plagioclase is likely not to be preserved in the matrix, calculated *P-T* conditions with this isopleth should be viewed as an upper *P-T* limit for the crossing of reaction [R1]. On the other hand, intersection of the isopleth calculated using touching garnet and plagioclase rims with reaction [R1] can provide a reliable *P-T* limit for the cessation of reaction [R2] in the retrograde sense, during cooling (see section 2.4.3.3).

Owing to extensive diffusional resetting of garnet cores at high temperatures, unmodified X_{Fe} of prograde garnet is not likely to have been preserved in any of the porphyroblasts. However, in specimen 11E1: (a) low X_{Fe} in garnet cores can be used to constrain the thermal peak, and (b) the intersection between reaction [R1] and the X_{Fe} isopleth of garnet rims away from biotite (to avoid effects of late Fe-Mg exchange between the two minerals) can be used to estimate the *P-T* conditions at which reaction [R2] ceased during cooling (see section 2.4.3.3).

Intersection of the GASP isopleth with reaction [R1] sets an upper *P-T* limit for muscovite melting at approximately 1445 MPa and 785°C and yields retrograde *P-T* conditions of approximately 980 MPa and 730°C (Figure 5.12b) for crossing the same reaction during retrogression. Despite the lower X_{Fe} of sample 11E1 relative to sample 100 from slice #1, X_{Fe} isopleths in garnet yield suspiciously low temperatures. The peak

X_{Fe} in the field of reaction [R2] is located at a temperature of about 745°C, below that estimated by the GASP isopleths for entry in this field during the prograde evolution. This apparent difference may be due to two things: (a) the GASP calculation only gives an upper *P-T* limit; and (b) X_{Fe} in garnet may have been reset at the grain scale during retrogression. Intersection of both retrograde GASP and X_{Fe} - garnet isopleths with reaction [R1] are closely located at approximately 1000 MPa and 750 °C. If calculated prograde *P-T* conditions are not significantly overestimated, then the difference between these conditions and the retrograde ones implies significant decompression in the melt domain and longer crystallization in the field of reaction [R2] which may explain the lack of retrograde muscovite in sample 11E. This absence of retrograde muscovite may be better explained, however, by the bulk composition with sample 11E being poorer in K than sample 31A which has a typical pelite composition and contains muscovite.

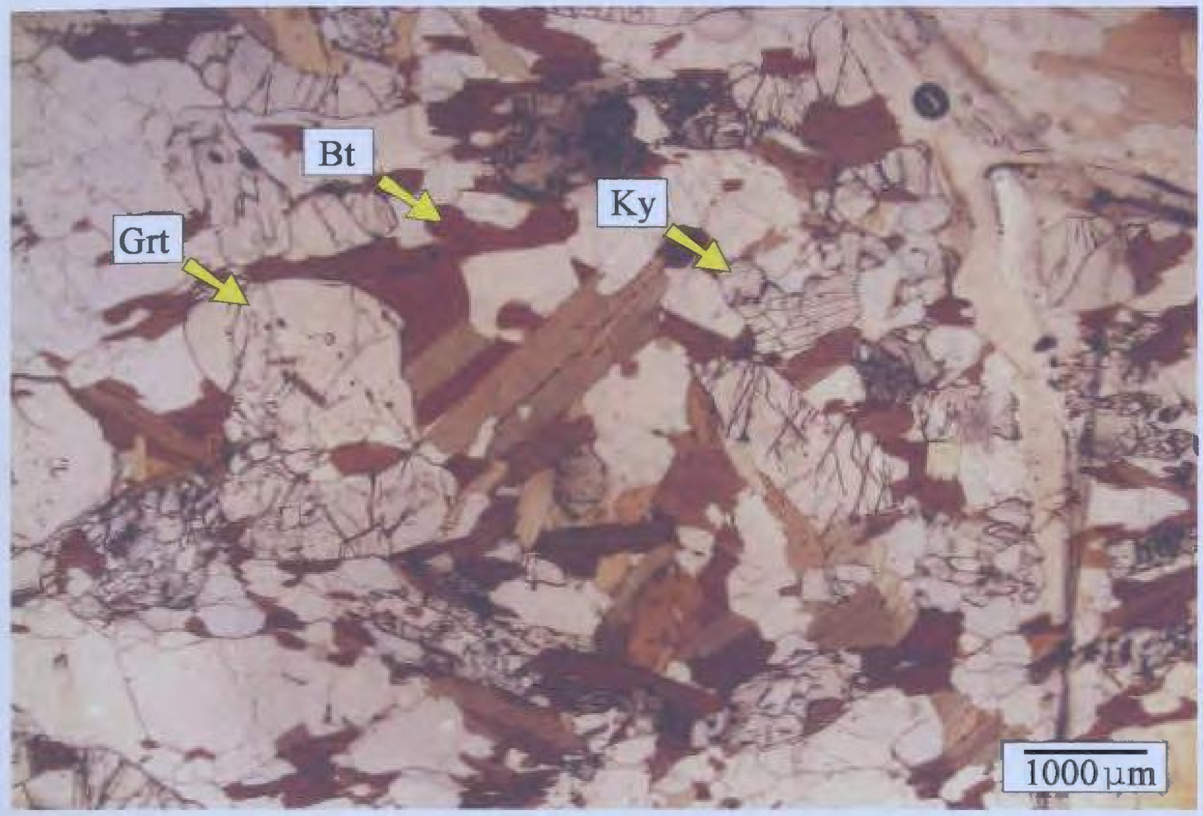
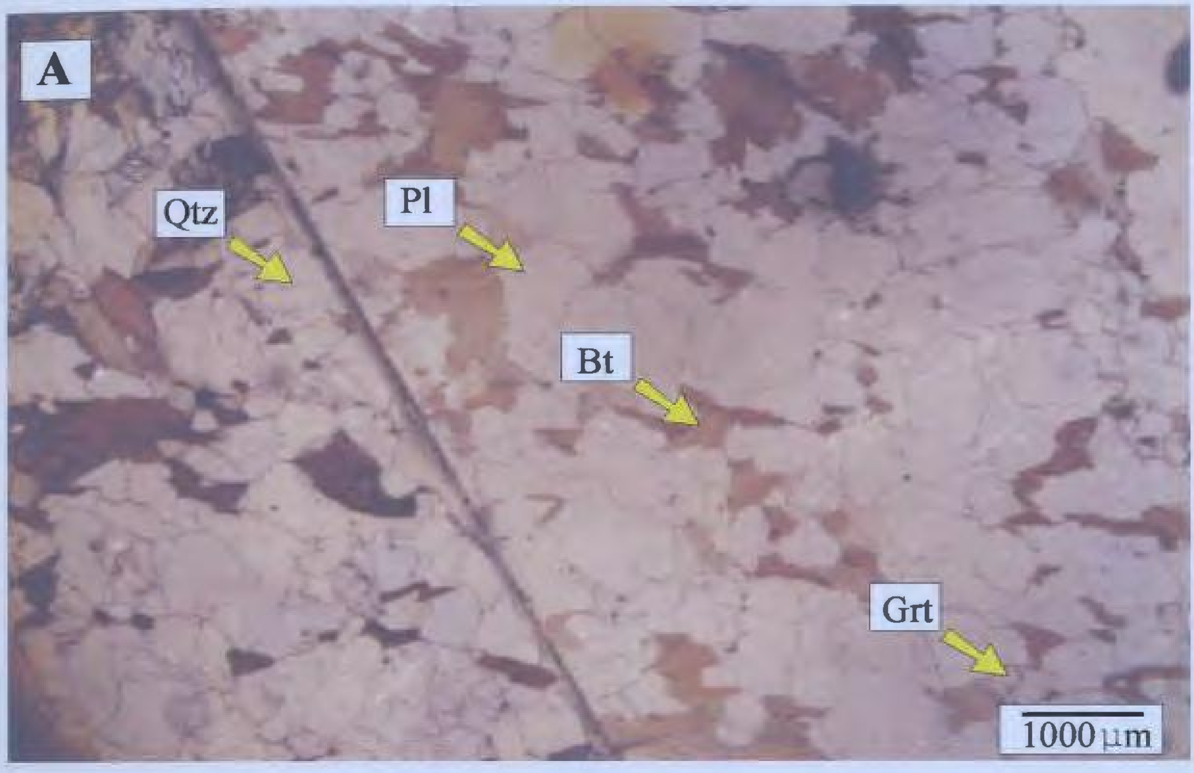


Plate 5.1: Close-up of a discontinuous layer rich in kyanite, garnet and biotite (specimen 11E1).



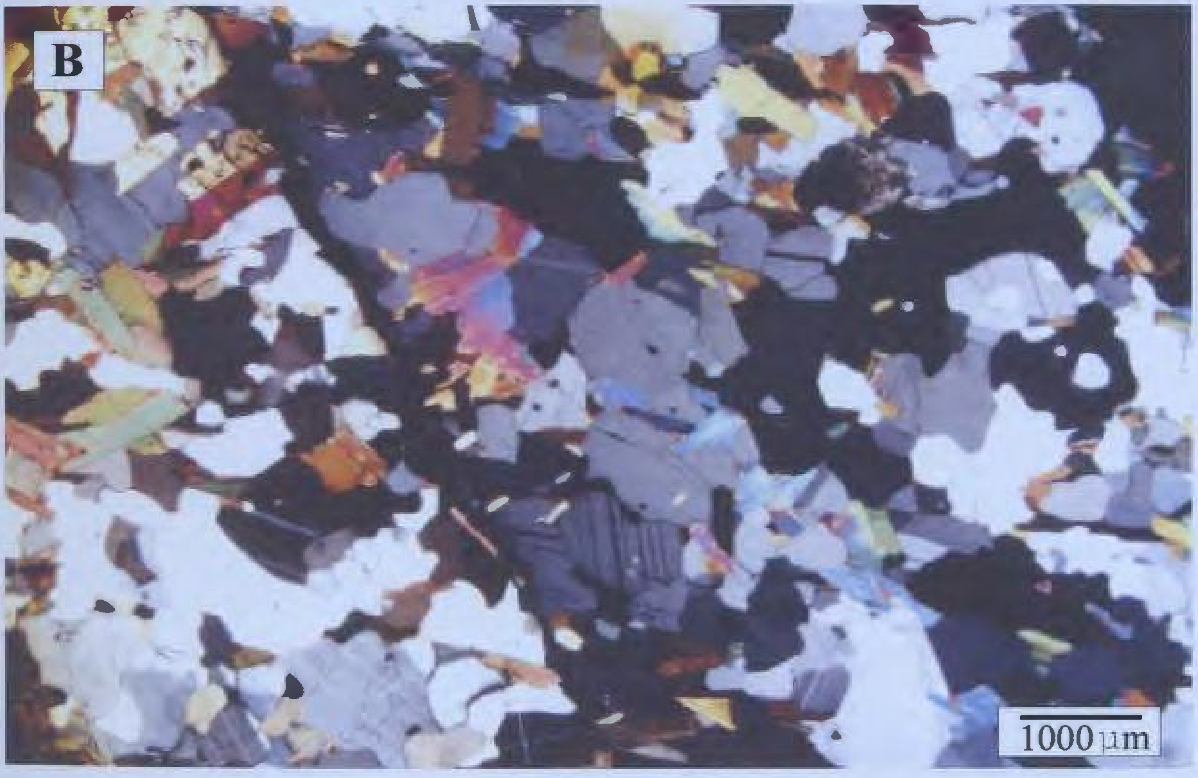


Plate 5.2: Discontinuous quartzofeldspathic layer from specimen 11E1. (A) plane polarized light and (B) cross polarized light.

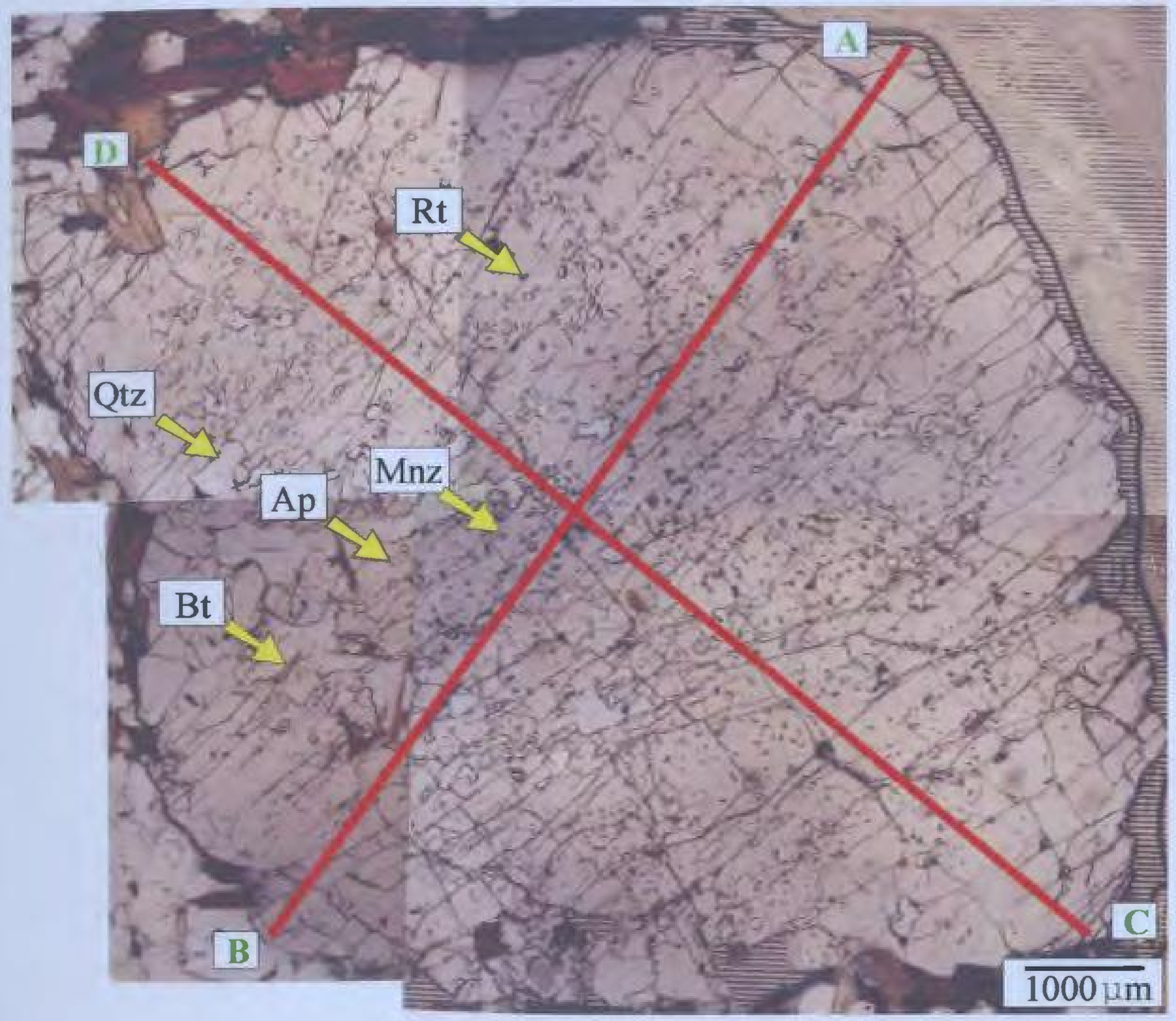


Plate 5.3: Garnet I from specimen 11E2 with inclusions of quartz, biotite, apatite, monazite, and rutile. Lines A-B and C-D indicate paths of microprobe analyses (see Figures 5.3 and 5.4). The striped material partially rimming the garnet is epoxy that was damaged during microprobe analysis.

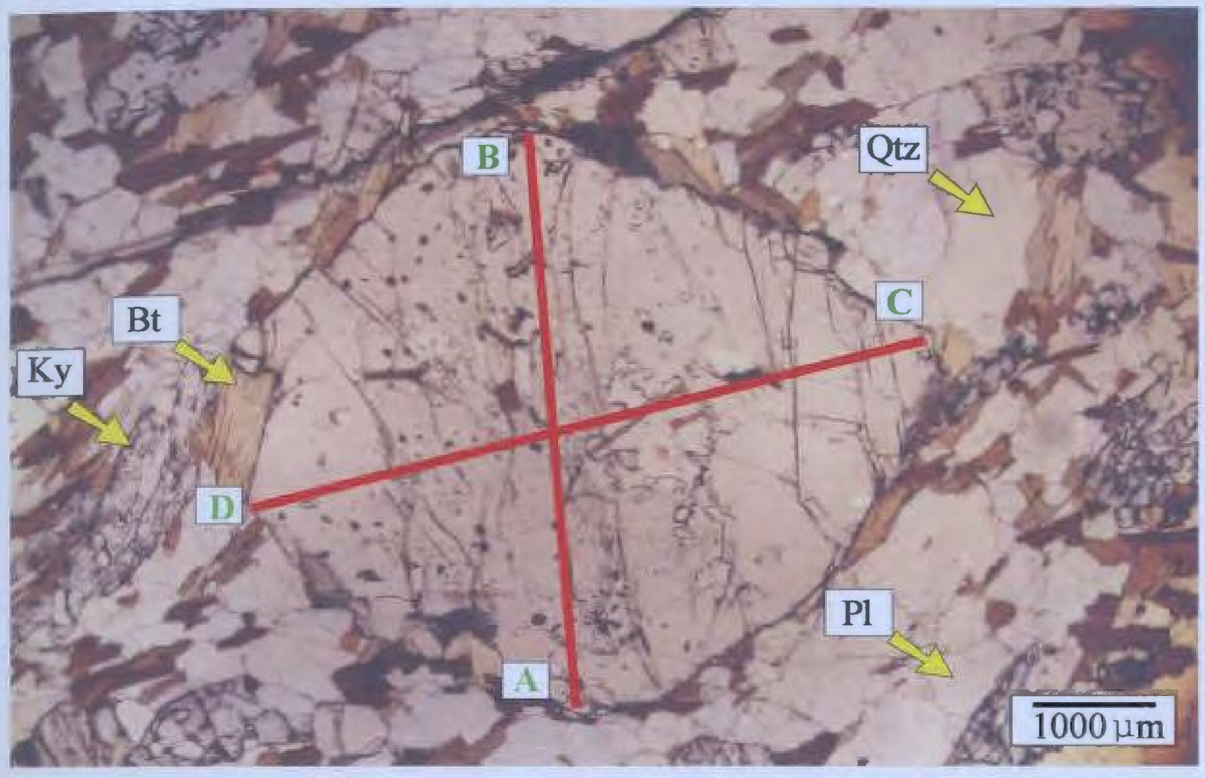
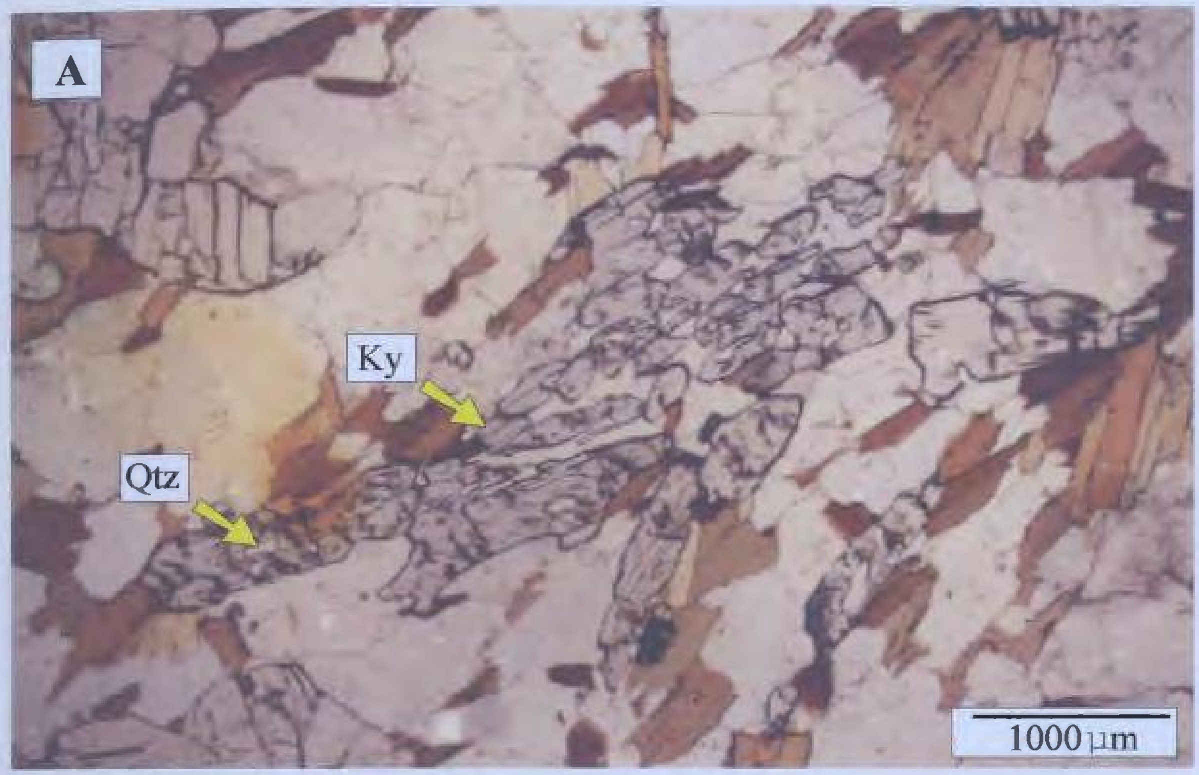


Plate 5.4: Garnet II from specimen 11E1 with inclusions of biotite, quartz, plagioclase, apatite, monazite, and rutile concentrated along the short axis of the grain. Lines A-B and C-D indicate paths of microprobe analyses (See Figures 5.5 and 5.6).



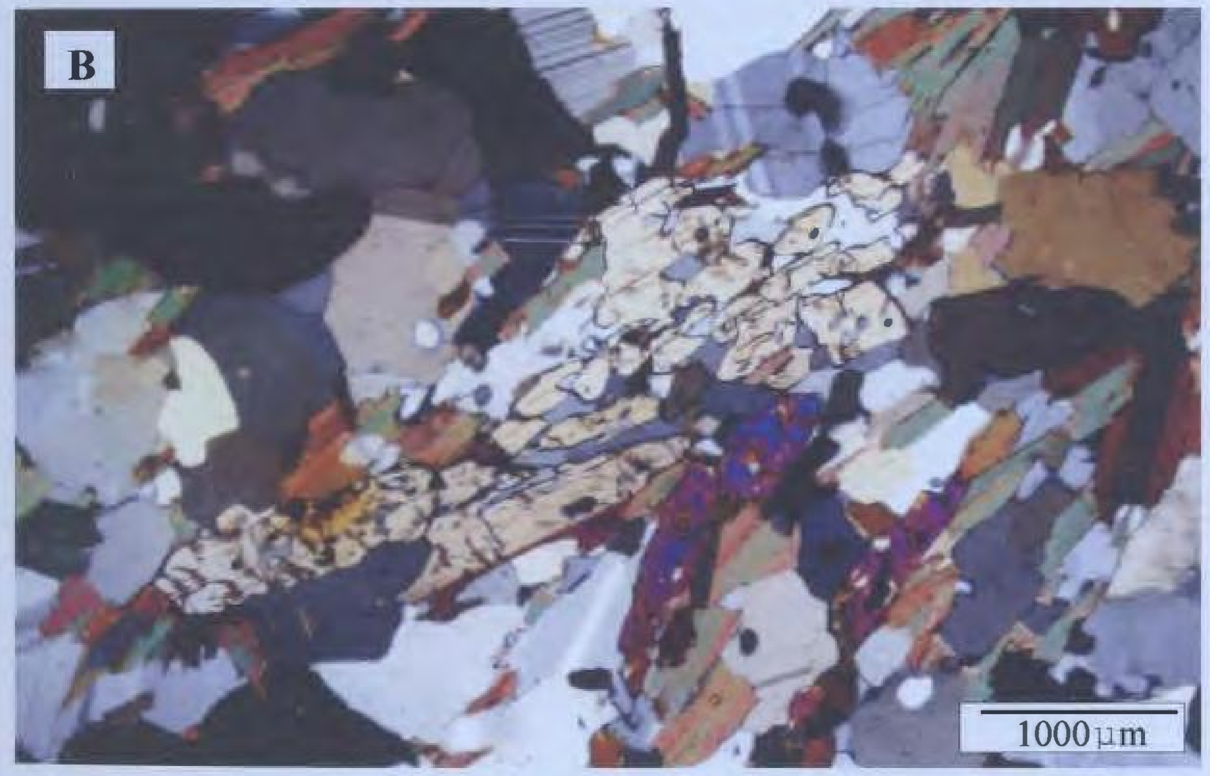


Plate 5.5: Kyanite blades containing inclusions of quartz (specimen 11E1). (A) plane polarized light and (B) cross polarized light.

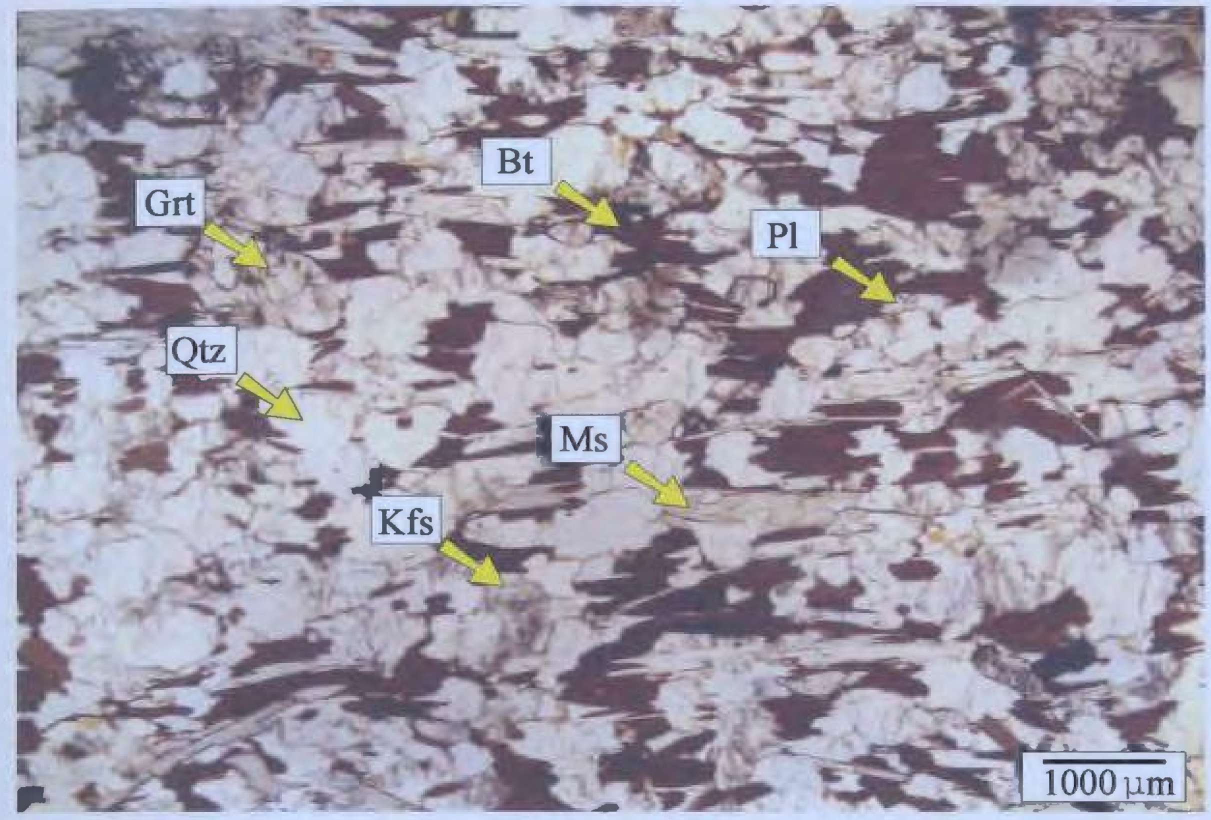
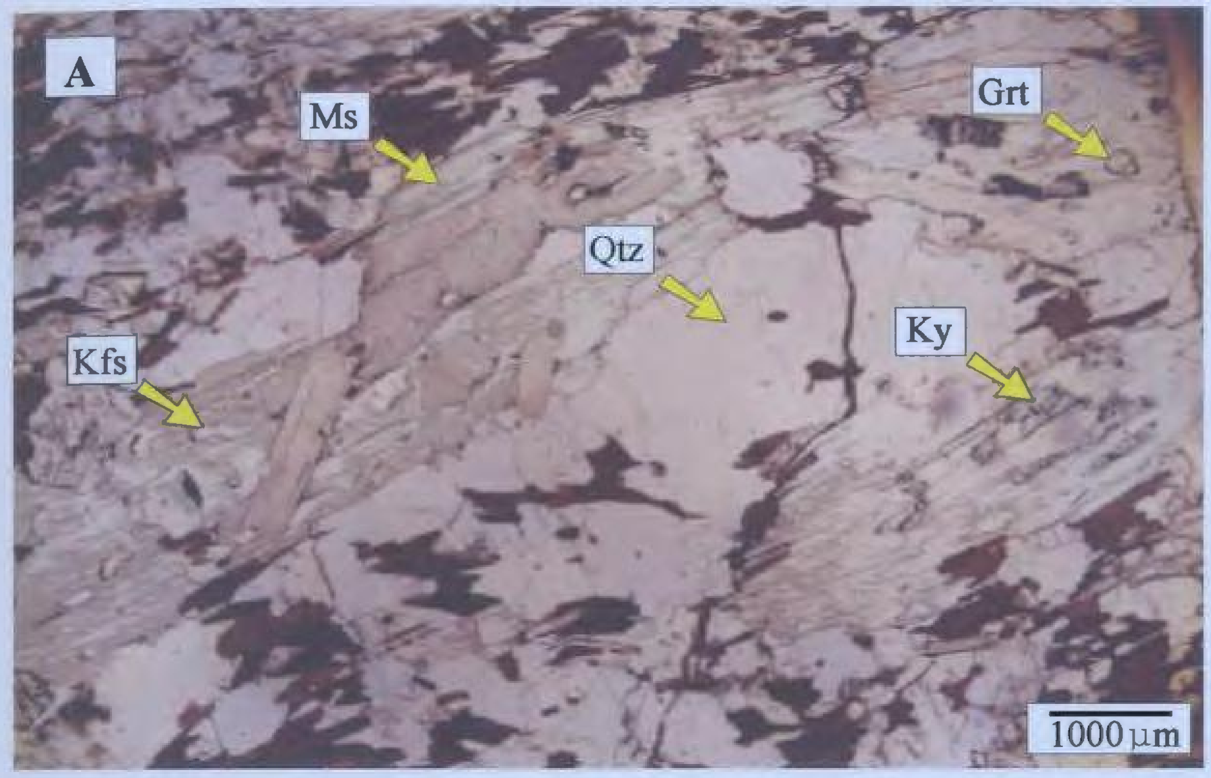


Plate 5.6: Fine-grained layer containing retrograde muscovite which formed during melt crystallization (sample 31A).



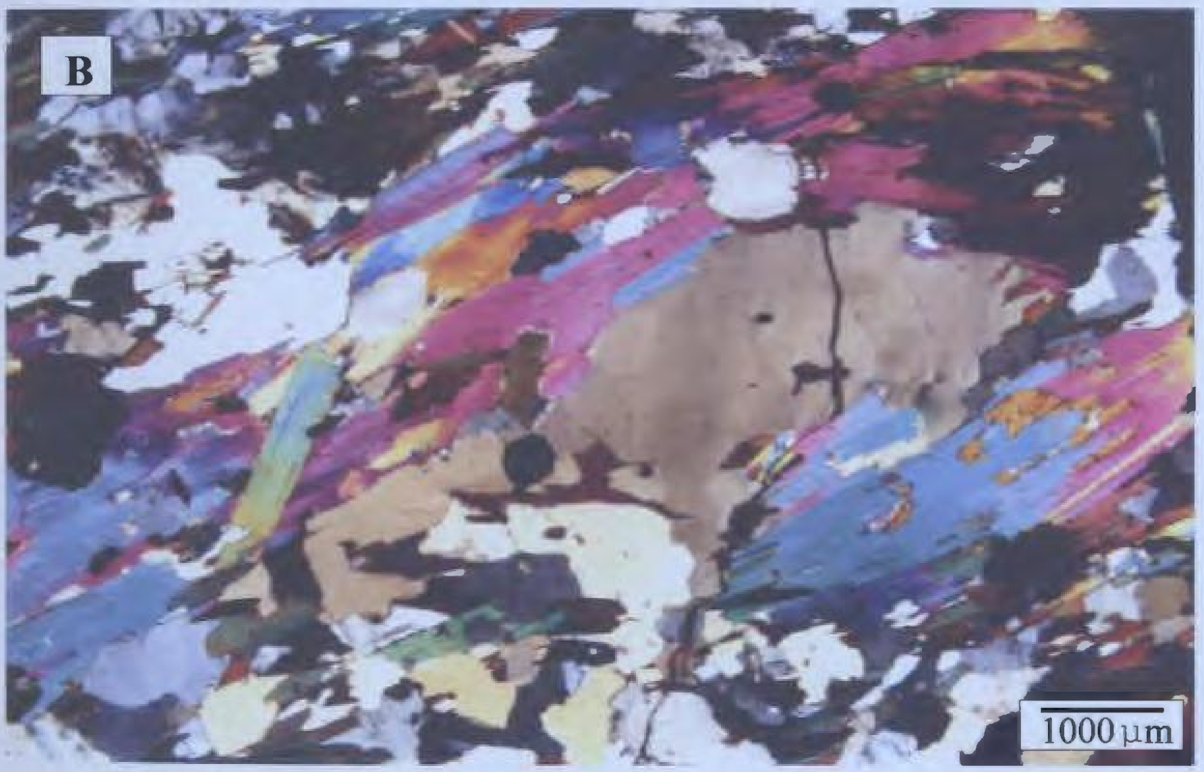
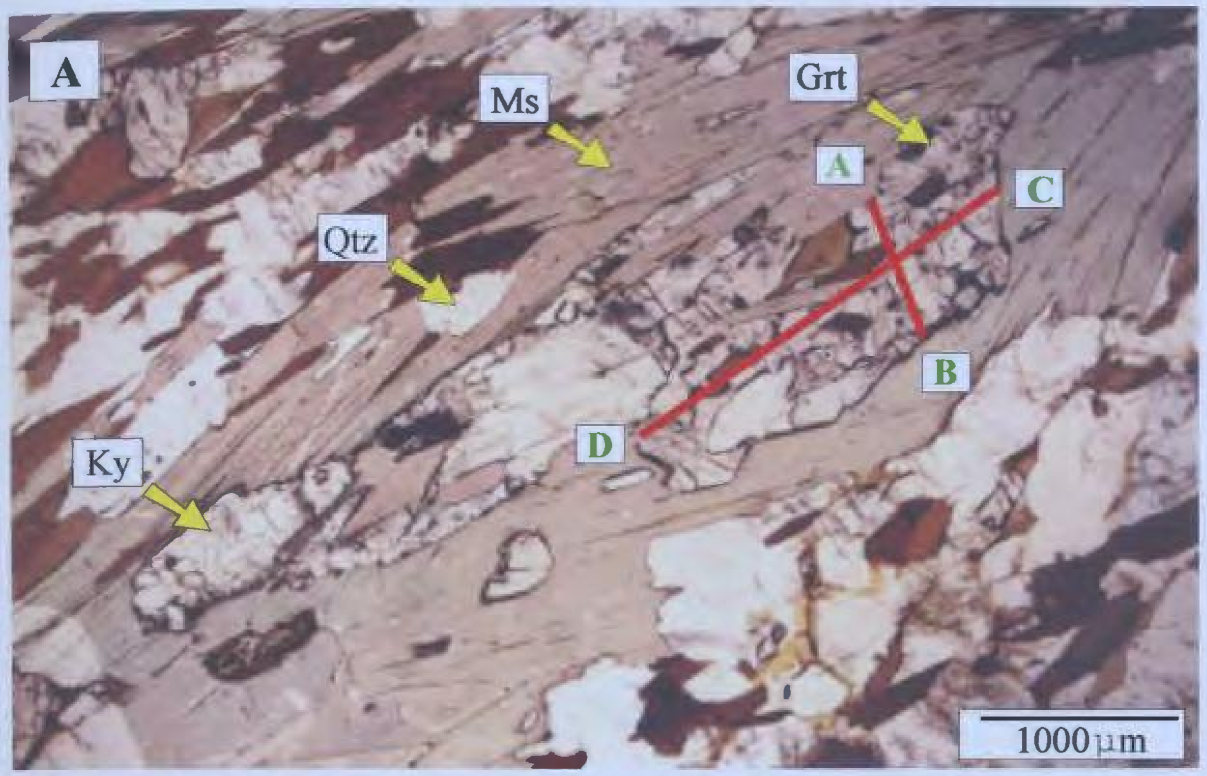


Plate 5.7: Coarse-grained area with retrograde muscovite replacing kyanite and K-feldspar during melt crystallization (sample 31A). (A) plane polarized light and (B) cross polarized light.



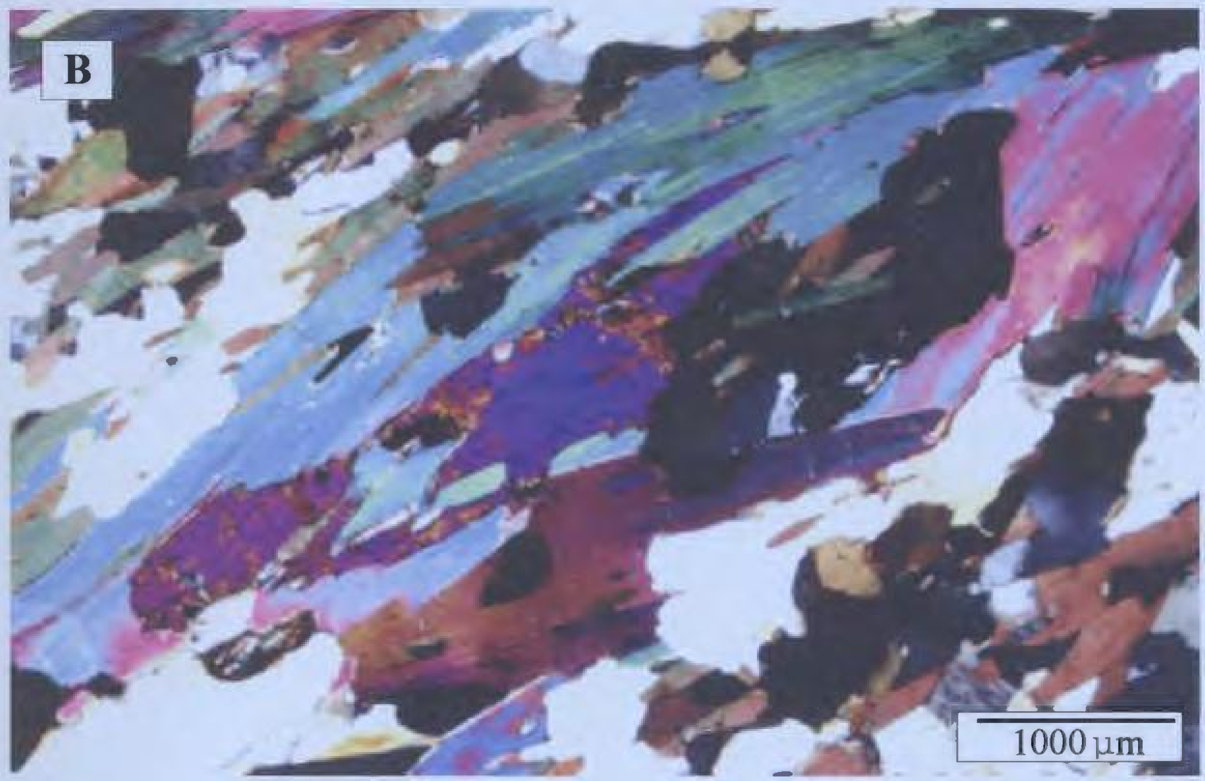


Plate 5.8: Retrograde muscovite aggregates corroding kyanite and quartz (sample 31A). These aggregates also contain relict garnet inclusions. Lines A-B and C-D indicate paths of microprobe analyses across a relict garnet (See Figure 5.7). (A) plane polarized light and (B) cross polarized light.

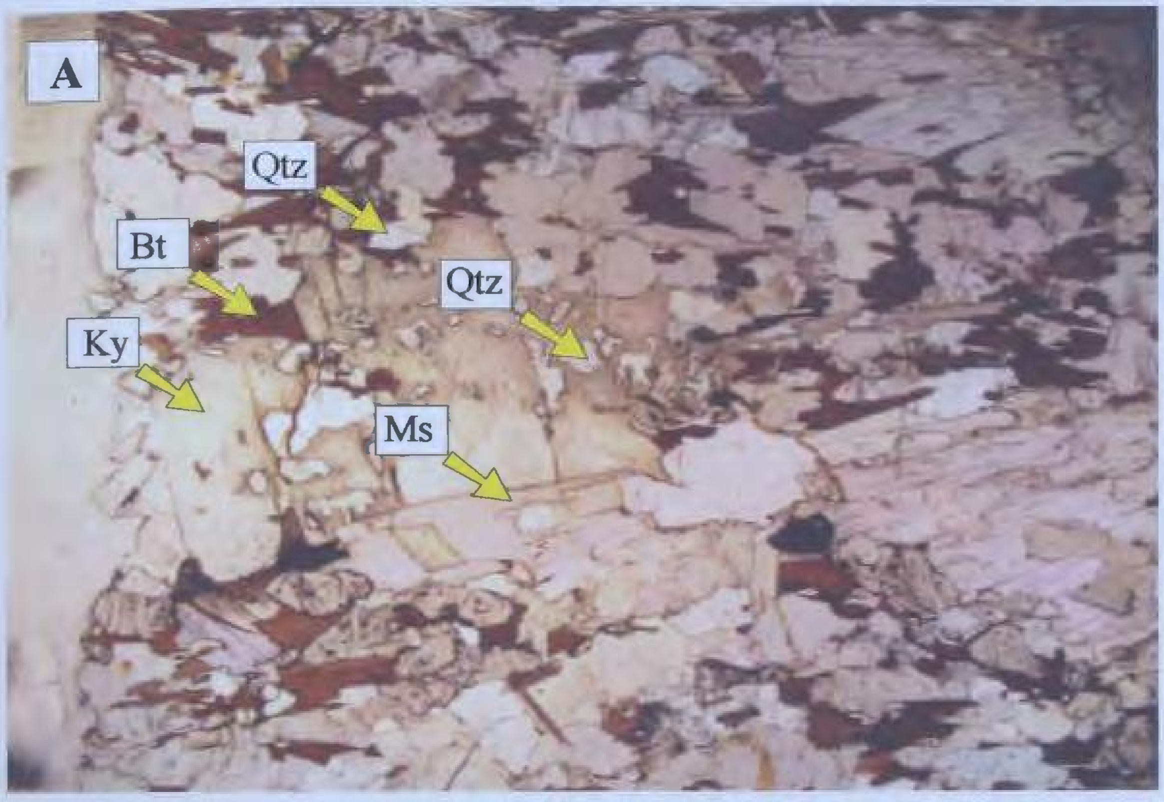


Plate 5.9: Kyanite porphyroblast containing minor quartz inclusions (sample 31A). (A) plane polarized light and (B) cross polarized light.

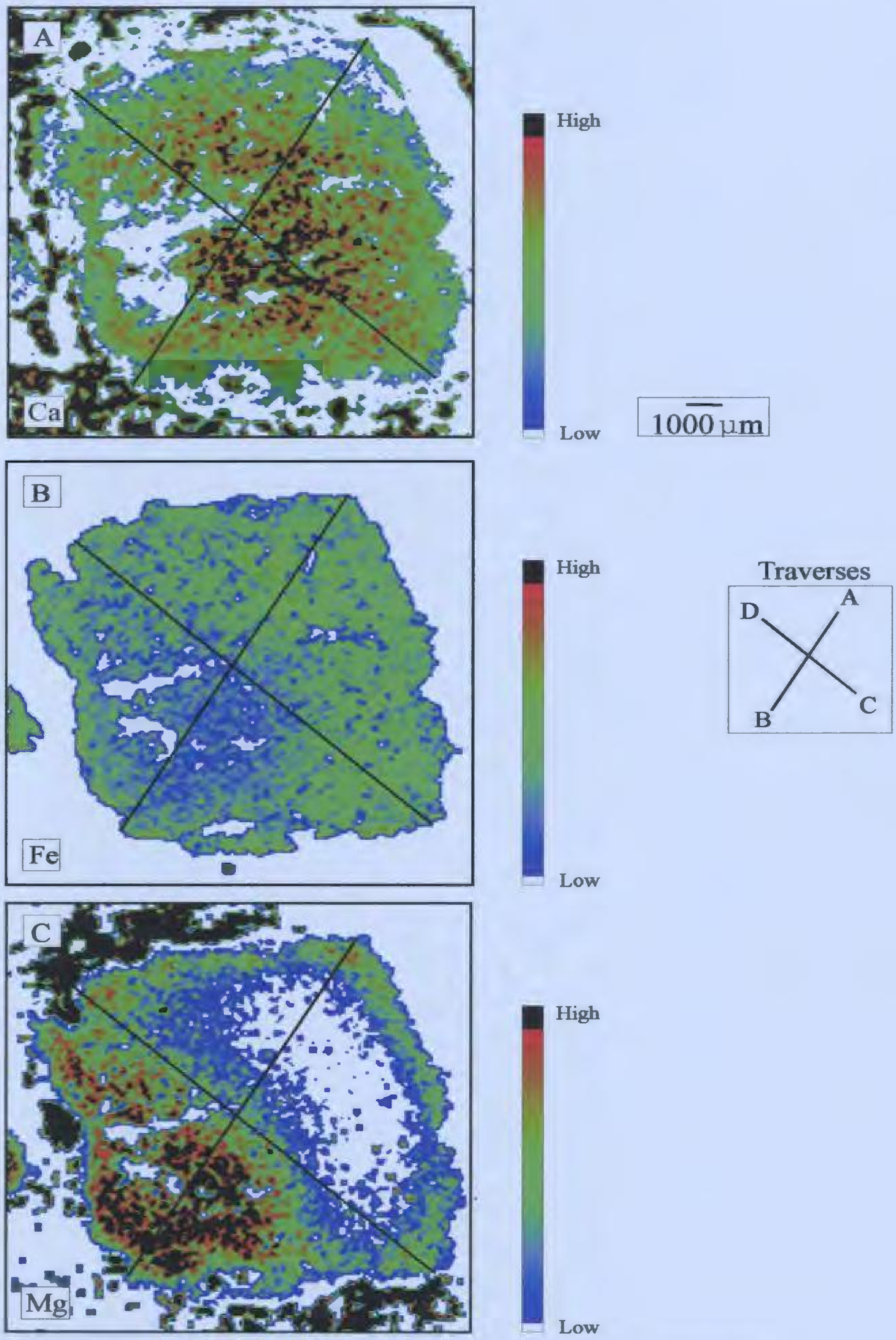


Figure 5.1: Compositional X-ray maps of Garnet I (specimen 11E2) in terms of (A) Ca, (B) Fe and (C) Mg. The color scale indicates relative abundance of the element.

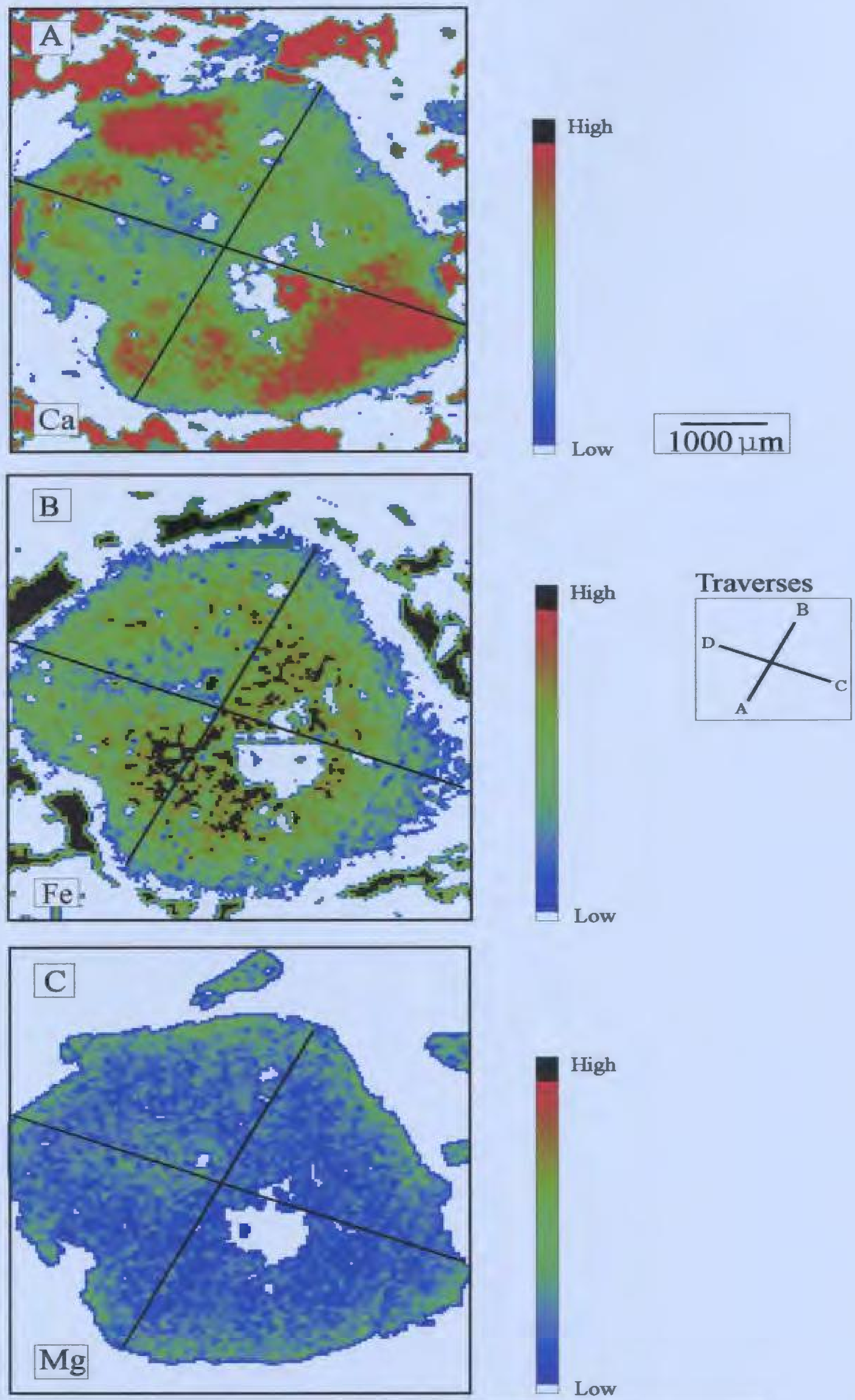


Figure 5.2: Compositional X-ray maps of Garnet II (specimen 11E1) in terms of (A) Ca, (B) Fe and (C) Mg. The color scale indicates relative abundance of the element.

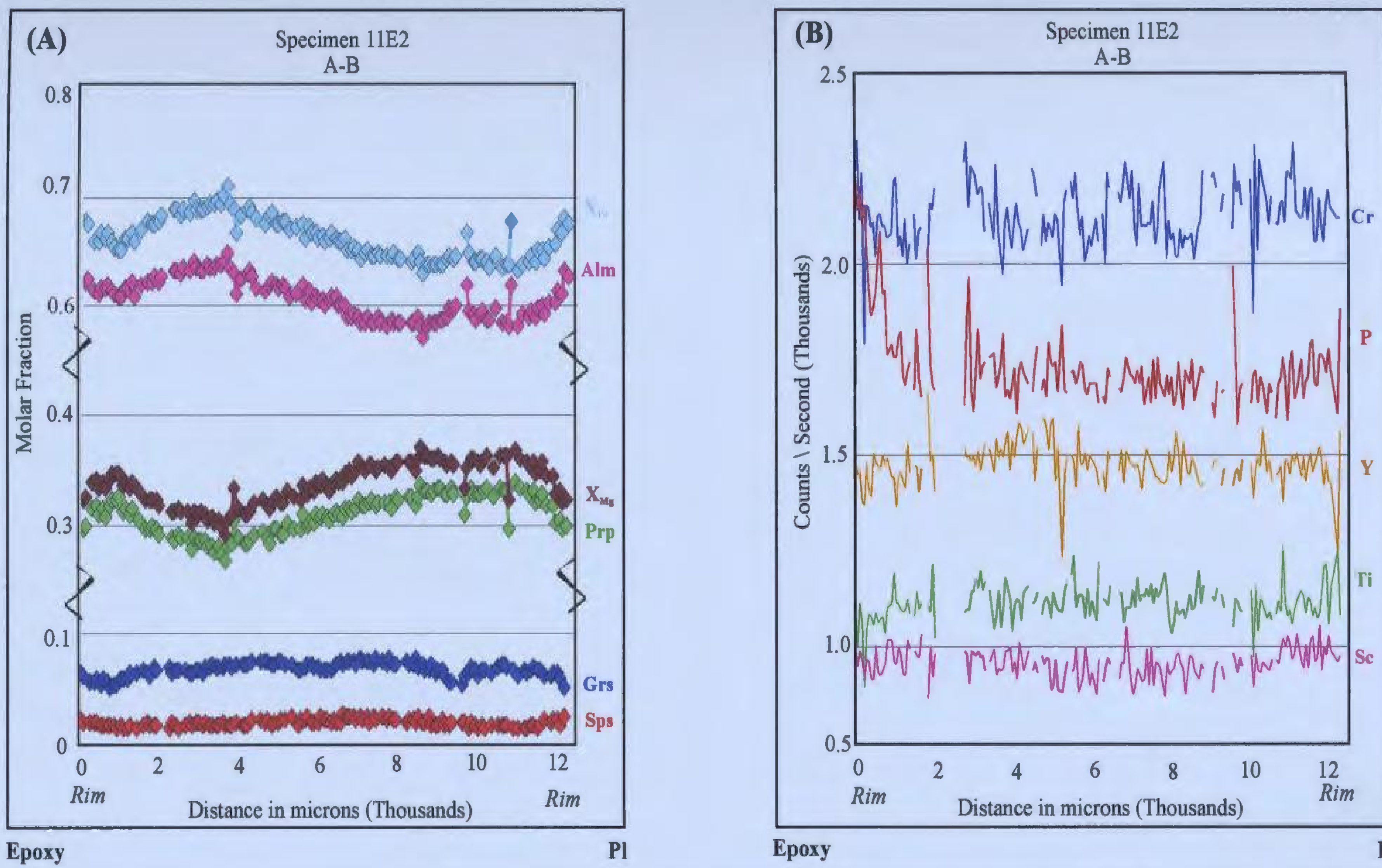


Figure 5.3: Zoning profiles of Garnet I (specimen 11E2) in terms of molar fractions of (A) Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 5.3 for location of transect. Rim A is in contact with the mounting epoxy; rim B is in contact with Pl.

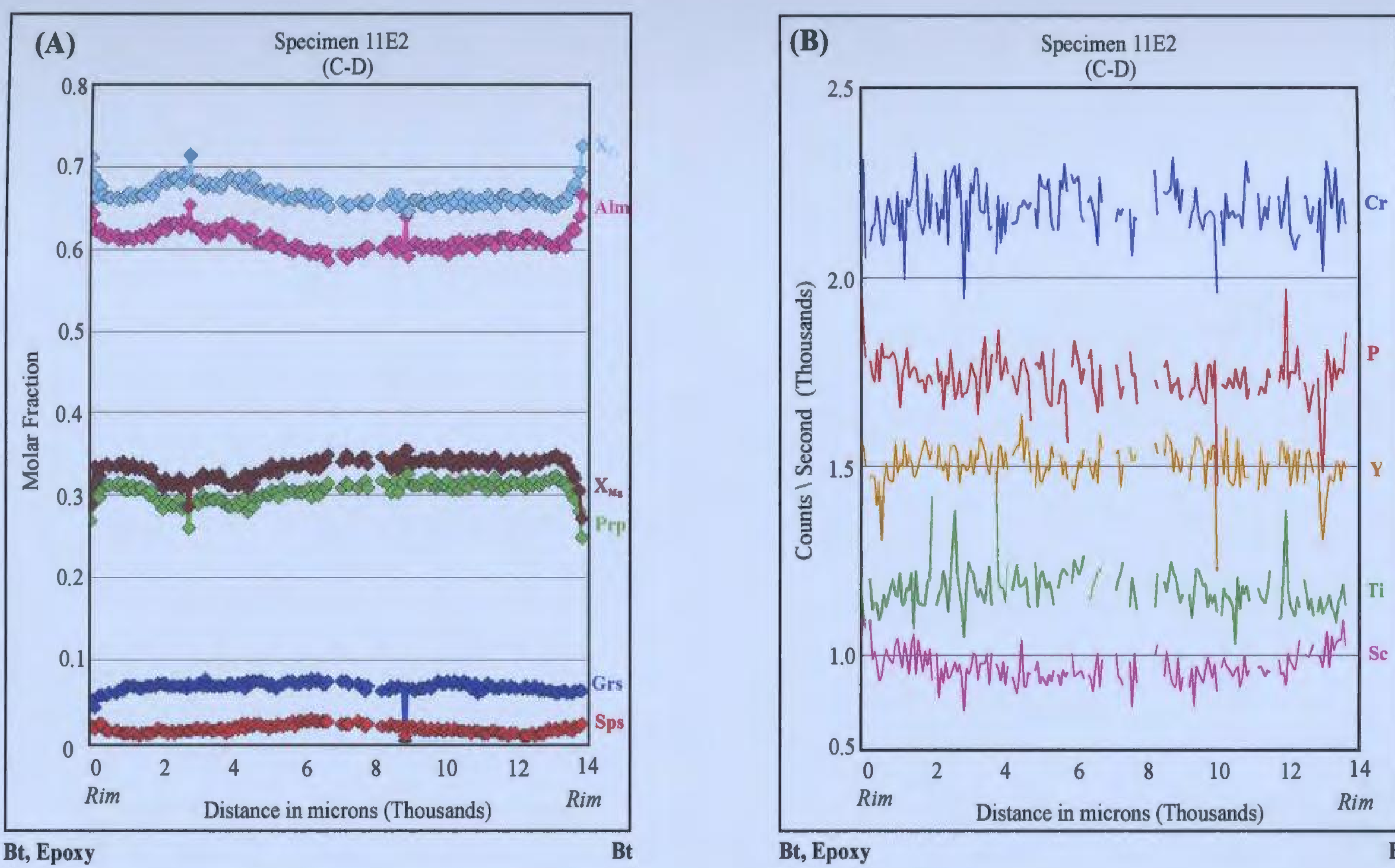


Figure 5.4: Zoning profiles of Garnet I (specimen 11E2) in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect C-D. See Plate 5.3 for location of transect. Rim C is in contact with Bt and the mounting epoxy; rim D is in contact with Bt.

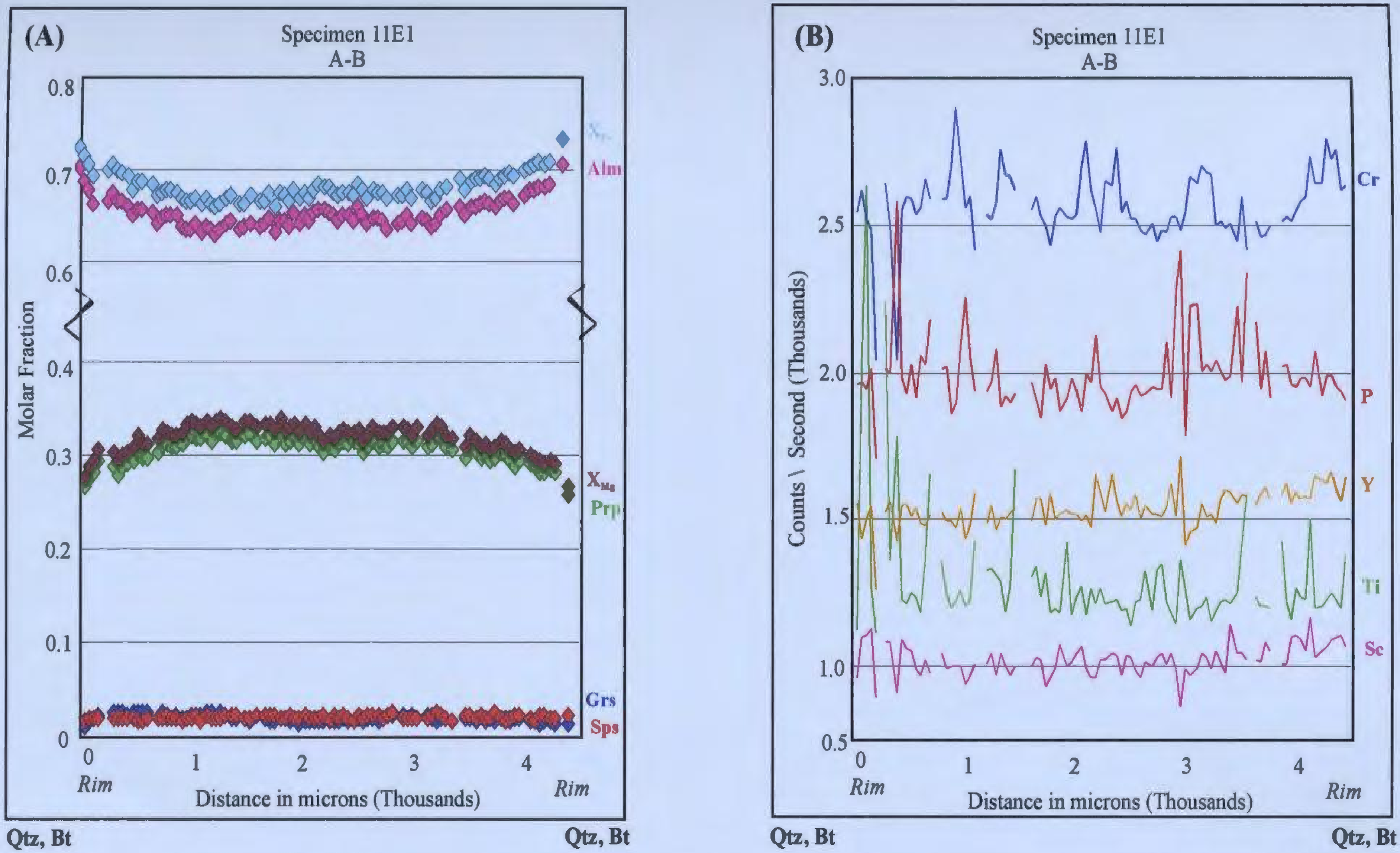


Figure 5.5: Zoning profiles of Garnet II (specimen 11E1) in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 5.4 for location of transect. Both rims are in contact with Qtz and Bt.

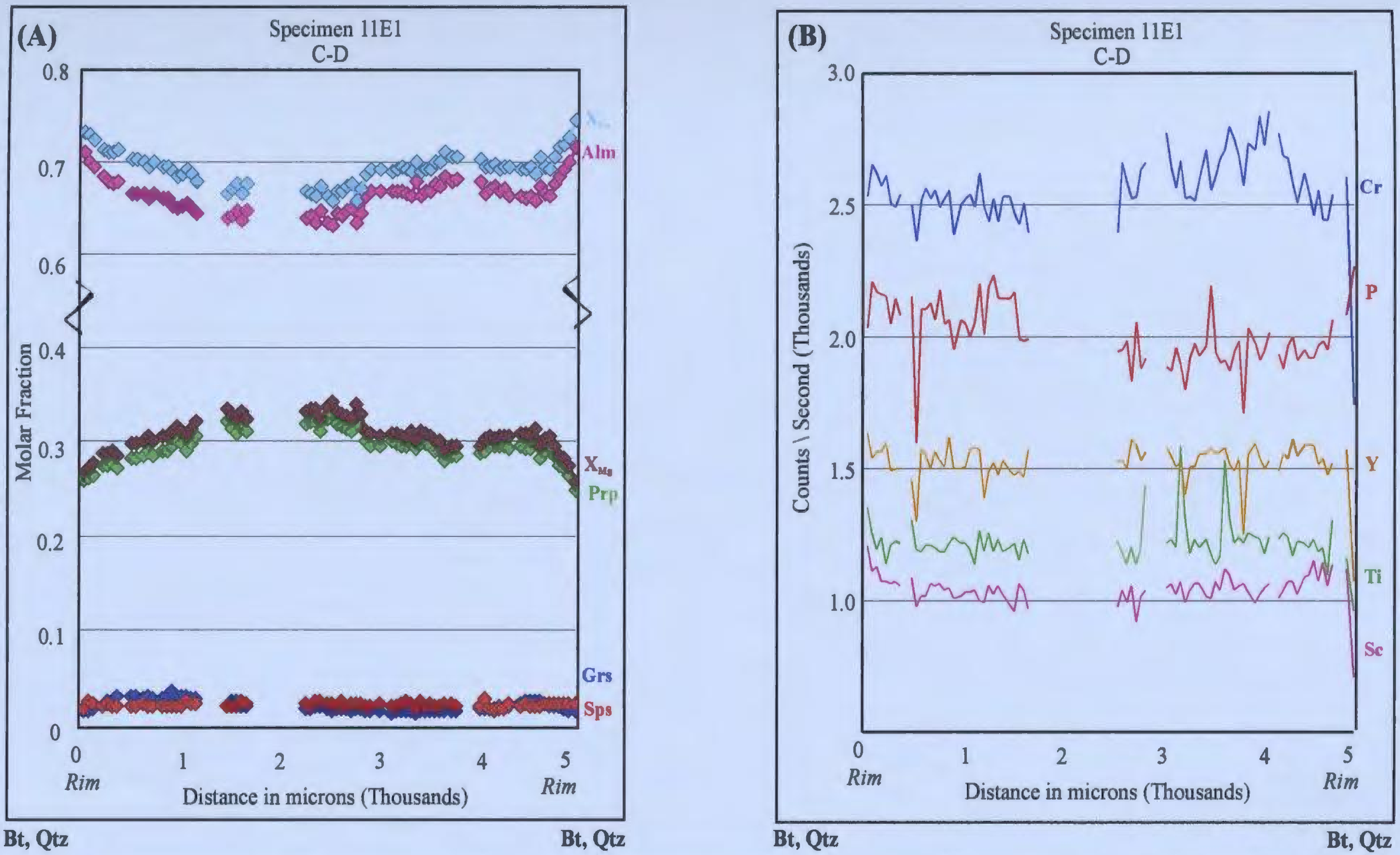


Figure 5.6: Zoning profiles of Garnet II (specimen 11E1) in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect C-D. See Plate 5.4 for location of transect. Both rims are in contact with Bt and Qtz.

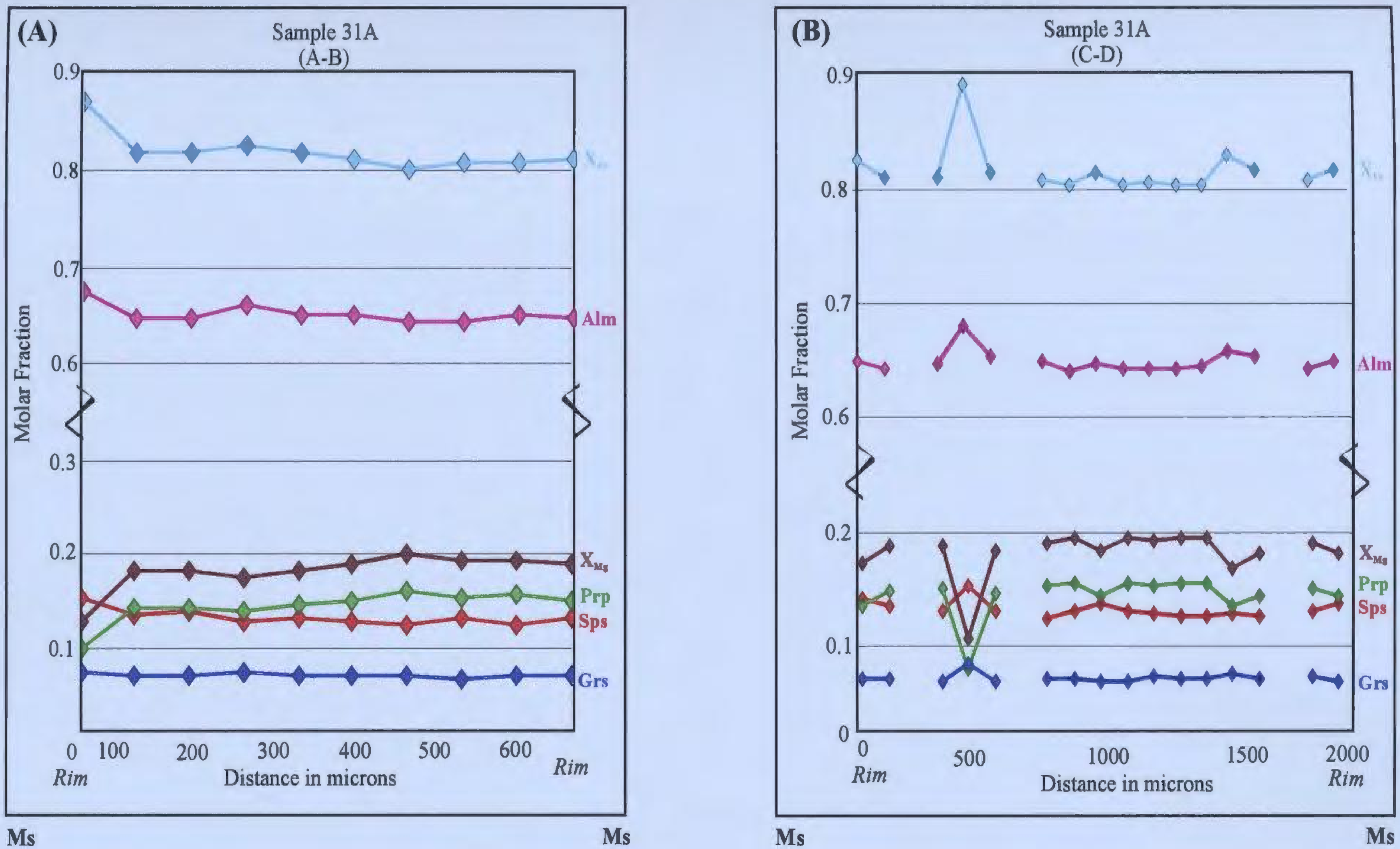
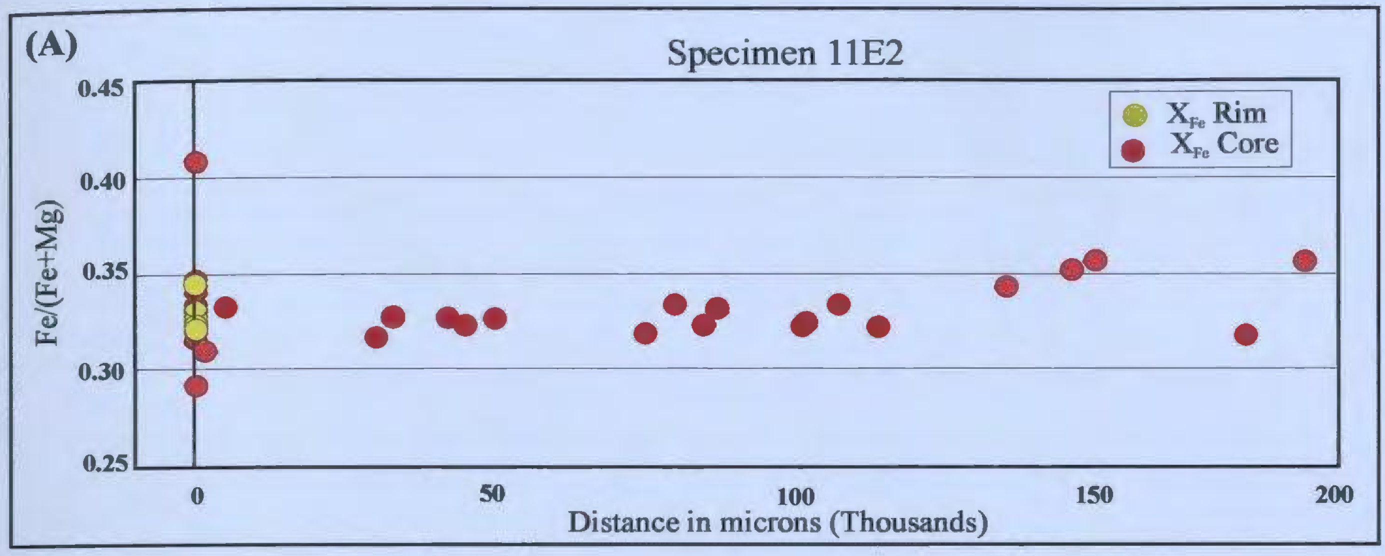


Figure 5.7: Zoning profiles of a garnet relic (sample 31A) in terms of molar fractions of Grs, Prp, Alm, and Sps along transects (A) A-B and (B) C-D. See Plate 5.8 for location of transects. All rims are in contact with retrograde Ms.



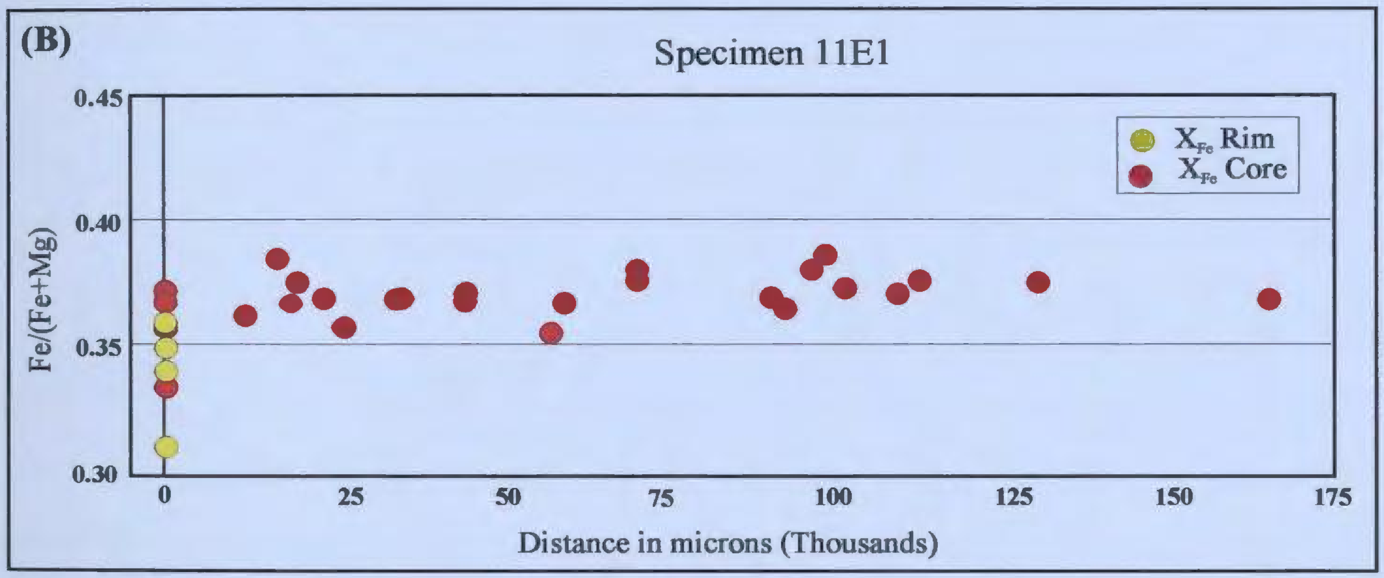


Figure 5.8: X_{Fe} biotite versus distance from (A) Garnet I in specimen 11E2 and (B) Garnet II in specimen 11E1.

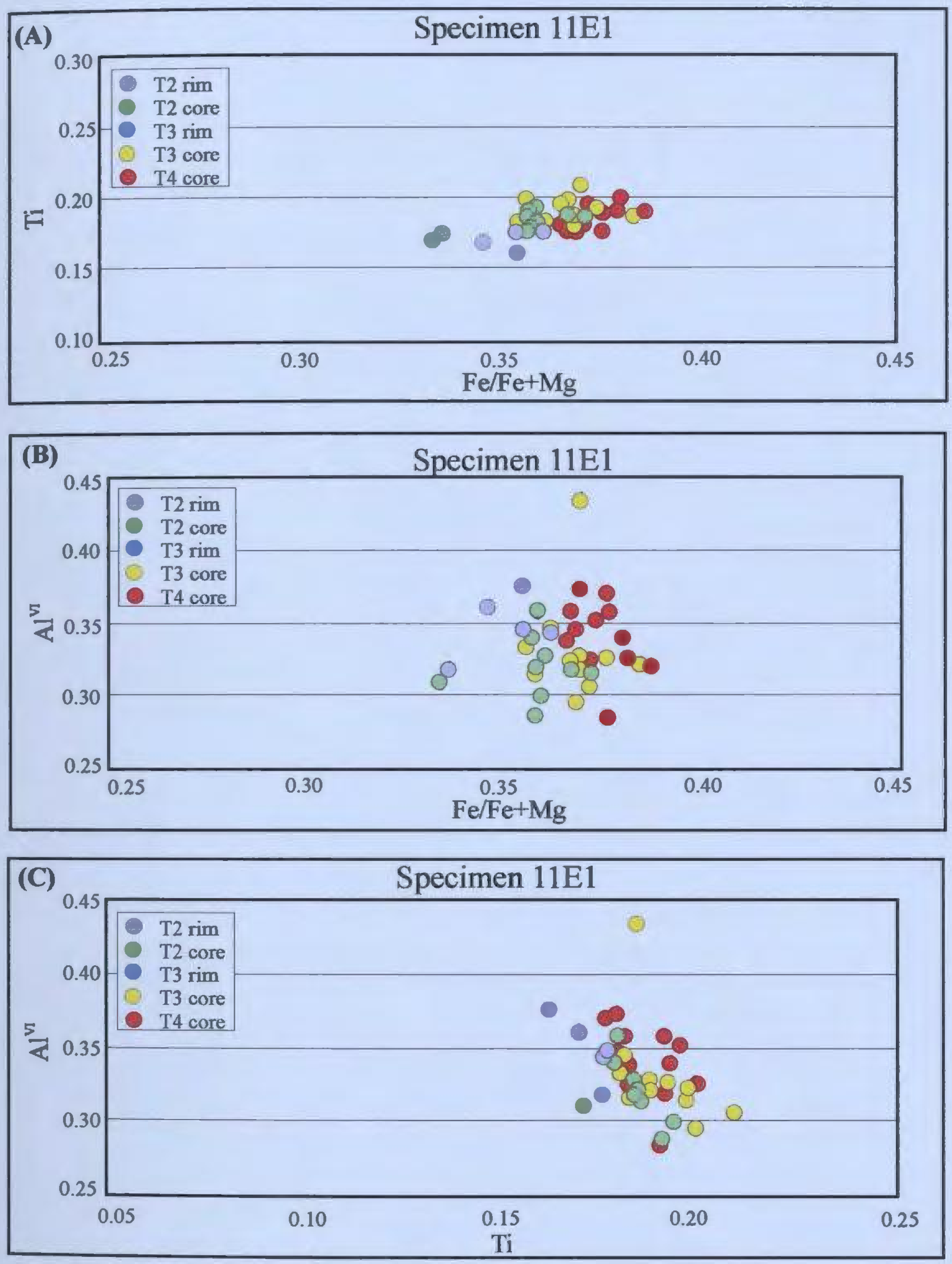


Figure 5.9: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from specimen 11E1.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from specimen 11E1.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite from specimen 11E1.

T2=biotite in contact with garnet, T3=biotite adjacent to garnet
T4=biotite isolated in the matrix.

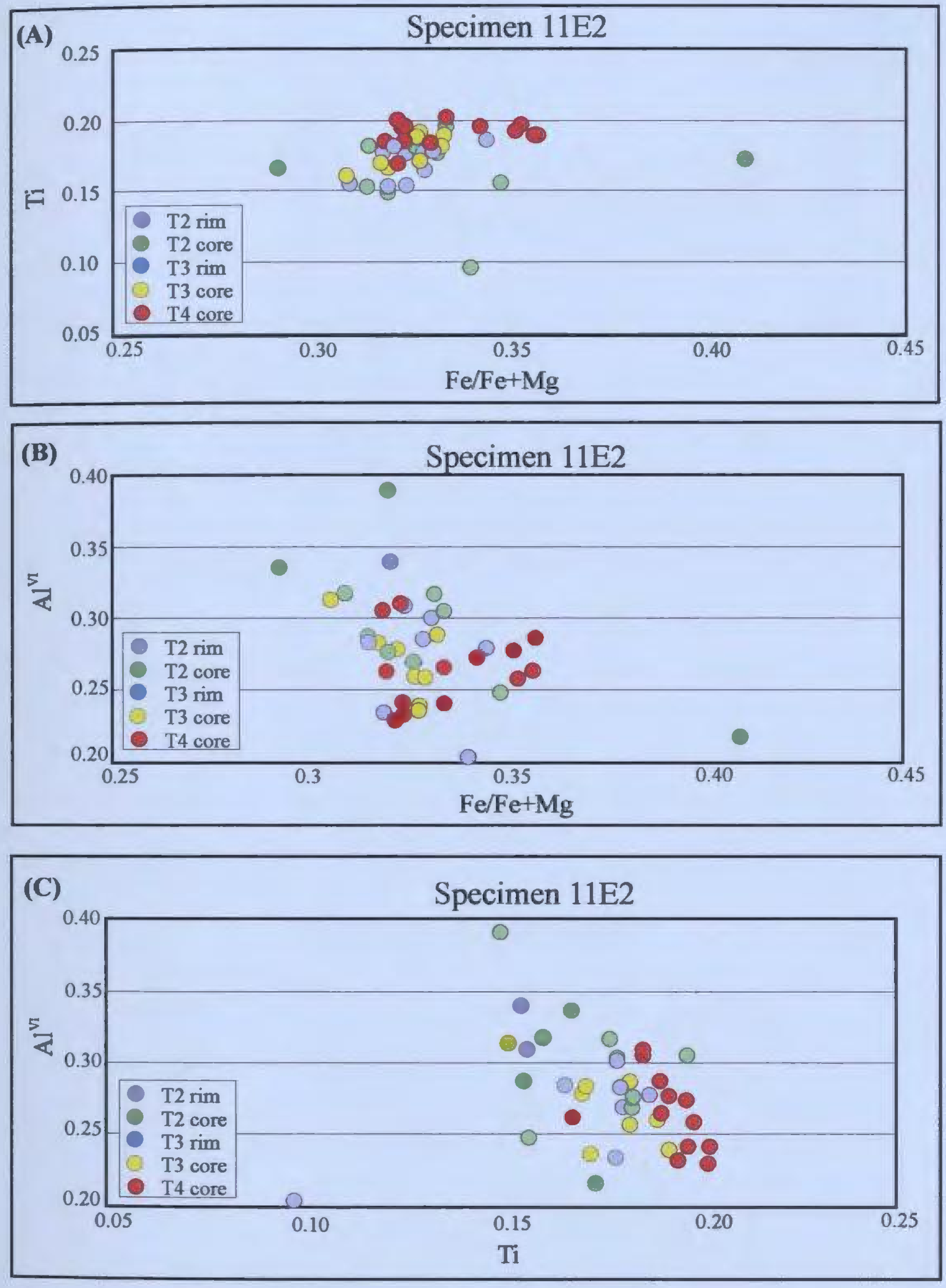


Figure 5.10: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from specimen 11E2.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from specimen 11E2.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite from specimen 11E2.
T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

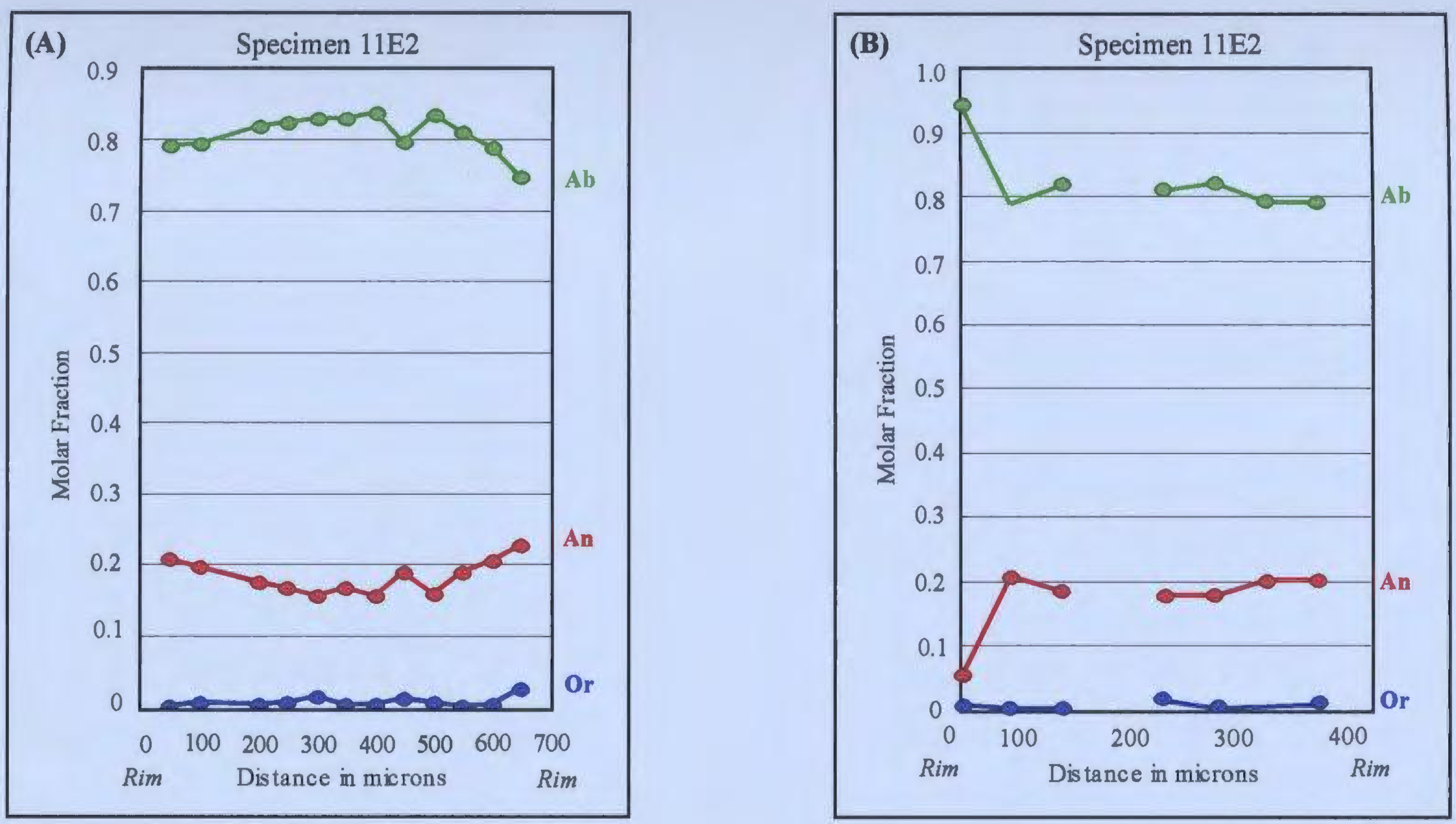


Figure 5.11: Zoning profiles in terms of molar fractions of Ab, An, and Or across: (A) a plagioclase grain adjacent to garnet (T3) and (B) a plagioclase grain touching garnet (T2). Both grains are from specimen 11E2.

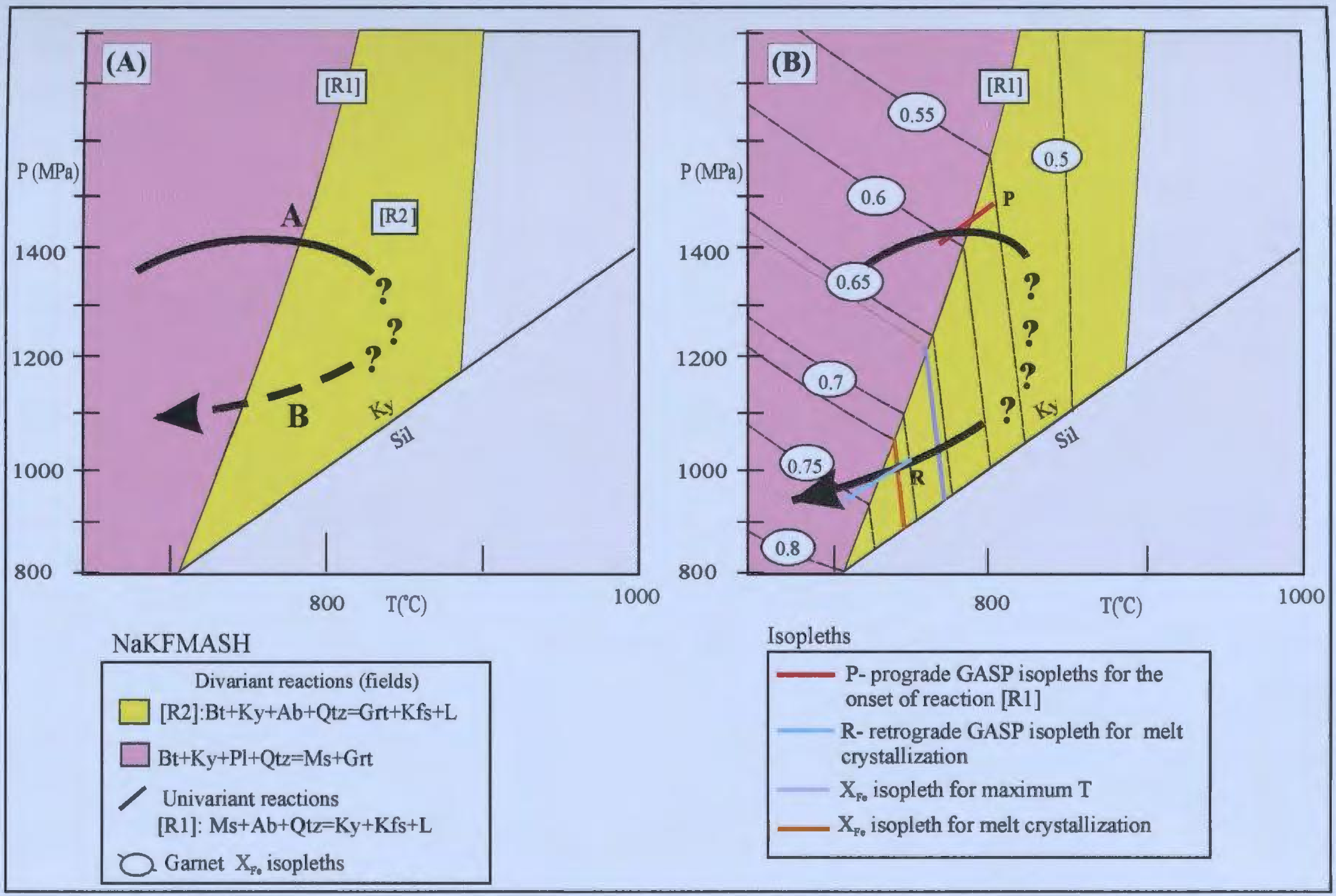


Figure 5.12: *P-T* diagram showing the locations of selected melting reactions in the kyanite field (NaKFMASH system) (modified after Spear et al. 1999) and the proposed *P-T* path for specimen 11E1. (A) qualitative *P-T* path deduced from textural interpretations; (B) *P-T* path constrained by GASP isopleths. Also shown are selected garnet X_{Fe} isopleths (specimen 11E1).

Table 5.1: Representative garnet analyses from thrust slice #2. See Tables 3.3a - 3.8a - Appendix 3 for complete data set.

			Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
		Type	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
11E1	1	rim	32.89	7.02	0.41	0.83	22.02	37.19	0.02	100.36	2.17	0.82	0.03	0.06	2.04	2.93	0.00	8.05	0.70	0.27	0.01	0.02	0.72	0.28
	9	Ca rich	31.22	7.54	0.94	0.87	21.64	37.74	0.02	99.95	2.05	0.88	0.08	0.06	2.00	2.96	0.00	8.04	0.67	0.29	0.03	0.02	0.70	0.30
	50	core	30.75	7.97	0.62	1.08	21.73	37.74	0.00	99.89	2.02	0.93	0.05	0.07	2.01	2.96	0.00	8.04	0.66	0.30	0.02	0.02	0.68	0.32
11E2	1	rim	31.27	7.09	1.69	0.92	21.68	38.36	0.00	100.98	2.03	0.82	0.14	0.06	1.99	2.98	0.00	8.02	0.67	0.27	0.05	0.02	0.29	0.71
	50	core	29.30	7.54	2.66	0.89	21.50	38.82	0.00	100.69	1.90	0.87	0.22	0.06	1.96	3.01	0.00	8.01	0.62	0.29	0.07	0.02	0.31	0.69
31A	1	rim	30.50	2.56	2.64	6.80	20.60	36.29	0.03	99.50	2.08	0.31	0.23	0.47	1.98	2.96	0.00	8.05	0.67	0.10	0.07	0.15	0.87	0.13
	50	core	30.02	3.76	2.66	6.11	21.60	37.56	0.08	101.70	1.98	0.44	0.22	0.41	2.01	2.96	0.00	8.03	0.65	0.14	0.07	0.13	0.82	0.18

Table 5.2: Representative biotite analyses from thrust slice #2. T2 = biotite in contact with garnet, T3 = biotite adjacent to garnet and T4 = biotite isolated from garnet in the matrix. See Tables 4,2 and 4.3- Appendix 4 for complete data set.

			Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
	#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{VI}	Al^{IV}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
11E2	6r	2	8.59	36.96	18.01	11.13	15.12	0.14	2.99	92.79	0.82	2.75	1.25	0.34	0.69	1.68	0.01	0.17	7.70	0.29	0.71	0.24	0.58	0.12	0.06
	6c	2	9.42	37.70	17.66	11.89	15.12	0.00	3.24	95.02	0.88	2.77	1.23	0.29	0.73	1.65	0.00	0.18	7.73	0.31	0.69	0.26	0.58	0.10	0.06
	14c	3	9.13	36.92	16.79	12.79	14.72	0.29	3.43	93.79	0.87	2.76	1.24	0.24	0.80	1.64	0.02	0.19	7.74	0.33	0.67	0.28	0.57	0.08	0.07
	18c	4	9.71	36.73	16.41	12.33	14.47	0.00	3.43	93.08	0.93	2.77	1.23	0.23	0.78	1.63	0.00	0.20	7.77	0.32	0.68	0.27	0.57	0.08	0.07
11E1	17c	2	9.68	36.18	18.29	13.28	13.36	0.00	3.25	94.27	0.92	2.71	1.29	0.32	0.83	1.49	0.00	0.18	7.78	0.36	0.64	0.29	0.53	0.11	0.06
	17r	2	9.01	36.89	19.01	13.06	13.82	0.09	3.06	95.12	0.85	2.71	1.29	0.36	0.80	1.52	0.01	0.17	7.73	0.35	0.65	0.28	0.53	0.13	0.06
	20c	3	9.37	35.64	17.93	13.15	13.10	0.00	3.20	92.39	0.91	2.72	1.28	0.33	0.84	1.49	0.00	0.18	7.75	0.36	0.64	0.30	0.52	0.12	0.06
	35c	4	9.70	35.73	18.24	13.29	12.81	0.10	3.15	92.92	0.94	2.71	1.29	0.35	0.84	1.45	0.01	0.18	7.76	0.37	0.63	0.30	0.51	0.12	0.06

Table 5.3: Representative plagioclase analyses from thrust slice #2. Grain 3 is from specimen 11E1 while grain 4 is from specimen 11E2. T3 = plagioclase adjacent to garnet and T4 = plagioclase isolated from garnet in the matrix. See Tables 5.2 and 5.3 - Appendix 5 for complete data set.

Grain # and type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 3 T4	1	0	10.57	1.92	0.14	20.91	64.81	98.62	0.92	0.09	0.01	1.10	2.89	5.02	0.90	0.09	0.01
	2	26	10.67	1.69	0.11	20.55	64.31	97.34	0.93	0.08	0.01	1.09	2.90	5.02	0.91	0.08	0.01
	3	53	10.32	1.66	0.06	20.55	64.09	96.82	0.91	0.08	0.00	1.10	2.90	4.99	0.92	0.08	0.00
	4	79	10.18	1.58	0.14	20.22	64.61	96.73	0.89	0.08	0.01	1.08	2.93	4.98	0.91	0.08	0.01
	5	106	10.68	1.54	0.09	20.93	64.03	97.17	0.94	0.07	0.01	1.11	2.89	5.02	0.92	0.07	0.01
	7	159	10.71	1.46	0.12	20.69	64.47	97.45	0.94	0.07	0.01	1.10	2.91	5.02	0.92	0.07	0.01
	10	238	10.60	1.63	0.07	20.71	65.01	97.94	0.92	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	11	265	10.64	1.66	0.00	20.61	64.62	97.53	0.93	0.08	0.00	1.09	2.91	5.01	0.92	0.08	0.00
	12	291	10.69	1.51	0.08	20.81	64.87	97.87	0.93	0.07	0.00	1.10	2.91	5.01	0.92	0.07	0.00
	13	318	10.81	1.48	0.10	20.71	65.22	98.32	0.94	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	14	344	10.62	1.68	0.07	20.44	64.47	97.22	0.93	0.08	0.00	1.09	2.91	5.01	0.92	0.08	0.00
	16	397	10.26	1.65	0.03	20.57	64.33	96.80	0.90	0.08	0.00	1.10	2.91	4.99	0.92	0.08	0.00
	17	424	10.39	1.63	0.07	20.13	63.58	95.74	0.92	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	18	450	10.29	1.51	0.00	20.13	63.82	95.75	0.91	0.07	0.00	1.09	2.92	4.99	0.93	0.08	0.00
Grain 4 T3	1	0	9.37	4.48	0.00	23.30	62.65	99.81	0.81	0.21	0.00	1.22	2.78	5.02	0.79	0.21	0.00
	2	54	9.43	4.26	0.14	22.41	63.31	99.41	0.81	0.20	0.01	1.17	2.81	5.00	0.79	0.20	0.01
	4	163	9.50	3.72	0.05	22.17	63.80	99.19	0.82	0.18	0.00	1.16	2.84	4.99	0.82	0.18	0.00
	5	217	9.73	3.59	0.12	22.47	63.03	98.82	0.84	0.17	0.01	1.18	2.82	5.01	0.83	0.17	0.01
	6	271	9.80	3.35	0.25	22.01	63.62	99.03	0.85	0.16	0.01	1.16	2.84	5.02	0.83	0.16	0.01
	7	325	9.53	3.48	0.06	21.84	63.38	98.23	0.83	0.17	0.00	1.15	2.84	4.99	0.83	0.17	0.00
	8	379	9.87	3.33	0.07	22.87	63.89	99.96	0.84	0.16	0.00	1.19	2.82	5.01	0.84	0.16	0.00
	9	433	8.98	3.90	0.22	22.82	63.46	99.16	0.77	0.19	0.01	1.19	2.82	4.97	0.80	0.19	0.01
	10	488	9.81	3.40	0.10	22.54	63.53	99.28	0.85	0.16	0.01	1.18	2.82	5.01	0.83	0.16	0.01
	11	542	9.42	3.99	0.00	22.57	62.63	98.60	0.82	0.19	0.00	1.19	2.81	5.01	0.81	0.19	0.00
	12	596	9.45	4.47	0.09	23.14	62.96	100.01	0.81	0.21	0.00	1.21	2.79	5.02	0.79	0.21	0.00
	13	650	8.53	4.69	0.44	23.65	62.18	99.49	0.74	0.22	0.03	1.24	2.77	4.99	0.75	0.23	0.03

Table 5.4: Representative muscovite analyses from sample 31A with 'c' representing a core analysis. See Table 6.2 - Appendix 6 for complete data set.

	Oxide percentage								Cations on an 11 (O) basis							
#	Na_2O	K_2O	SiO_2	Al_2O_3	FeO	MgO	TiO_2	Total	Na	K	Si	Al	Fe	Mg	Ti	Total
1c	0.48	10.50	46.04	33.98	1.34	1.13	0.83	94.30	0.06	0.90	3.10	2.70	0.08	0.11	0.04	6.99
3c	0.46	10.10	46.52	34.21	1.29	1.23	1.01	94.82	0.06	0.86	3.10	2.69	0.07	0.12	0.05	6.96
4c	0.23	10.20	46.61	33.93	1.32	1.01	0.81	94.14	0.03	0.87	3.13	2.69	0.07	0.10	0.04	6.94
5c	0.29	10.33	46.09	34.36	1.33	1.14	0.94	94.49	0.04	0.88	3.09	2.72	0.07	0.11	0.05	6.96

CHAPTER 6: PETROLOGY AND METAMORPHIC INTERPRETATION OF METAPELITE FROM THRUST SLICE #3

The southernmost thrust slice (slice #3) contains migmatic metapelite (Plate 1.2), garnet - quartz bearing iron formation and amphibole + clinopyroxene + garnet mafic pods (personal communication, Indares 2001). Metapelite is more extensively migmatized than in the other slices and consists of discontinuous aluminous layers rich in kyanite and biotite alternating with or included in mainly quartzofeldspathic layers rich in K-feldspar. Three representative samples (207, 208 and 282) were selected for a detailed study. These samples have a pelitic composition and are iron rich (X_{Mg} = 0.31-0.34) (Table 2.1 - Appendix 2).

6.1 MINERALOGY AND TEXTURE

The samples consist of quartz, biotite, garnet, plagioclase, kyanite, K-feldspar, ± muscovite. Accessory phases are apatite, ± monazite, pyrite and rutile. Sample 207 consists of alternating layers of dominantly quartzofeldspathic and ferromagnesian minerals. Sample 282 is characterized by localized domains of pseudotachylite, likely associated with the Triassic Manicouagan Impact, transecting areas entirely devoid of this deformation feature. Finally, sample 208 consists of patchy coarse and fine-grained areas.

6.1.1 Sample 207

The quartzofeldspathic layers of sample 207 consist of quartz and antiperthitic alkali-feldspar up to 4000 μm in diameter (Plates 6.1), with porphyroblastic garnet, and subordinate plagioclase, biotite and embayed kyanite (Plate 6.2). The layers dominated by ferromagnesian minerals (Plate 6.3), on the other hand, consist predominantly of biotite aggregates, which define a fabric parallel to the layering, garnet, and subordinate plagioclase, quartz and K-feldspar. Exsolution of the alkali-feldspar is less pronounced than in the quartzofeldspathic layers. Garnet is porphyroblastic in both layers, with maximum diameter of 12000 μm. The largest garnet (Plate 6.4), which occurs in a quartzofeldspathic layer, is subidioblastic and has a core rich in amoeboid inclusions of quartz, apatite, variably altered K-feldspar + albite aggregates (Plate 6.5) and minor biotite, and an inclusion free-rim. This porphyroblast is locally rimmed by biotite and kyanite aggregates. Other garnet grains are smaller (<6000 μm) and are variably embayed by biotite and quartz (Plate 6.6). In both layers, kyanite occurs as blades which define the main fabric with biotite, and as amorphous grains which are locally surrounded by biotite. Apatite occurs as inclusions in garnet and in altered K-feldspar + albite + quartz aggregates which are found throughout the garnet core.

6.1.2 Sample 282

The domains of sample 282 which are devoid of pseudotachylite consist predominantly of quartz, garnet, and biotite, minor kyanite, K-feldspar, and muscovite, and trace plagioclase (Plate 6.7). Accessory phases are rutile, apatite and monazite. Garnet occurs as porphyroblasts (up to 5000 μm in diameter) which are in contact with quartz and biotite and display inclusion-rich cores surrounded by clear rims. Inclusions consist of quartz, biotite and rutile and define a strong internal fabric that cannot be traced into the matrix (Plates 6.8 and 6.9). Biotite laths define a weak foliation, and are locally bent (Plate 6.10). Muscovite is present in trace amounts and is intergrown with biotite (Plate 6.11). Kyanite occurs as blades that contain inclusions of quartz and rutile, and is locally rimmed by K-feldspar (Plate 6.12) or biotite. Plagioclase occurs as rare interstitial grains in the matrix. As well as being included in garnet and kyanite, rutile also occurs in the matrix, surrounded by biotite. Small grains of monazite and apatite occur in the matrix and locally form larger grains adjacent to garnet and large biotite.

6.1.3 Sample 208

Sample 208, which consists of coarse and fine-grained areas (Plate 6.15), contains abundant muscovite, quartz, biotite, garnet, kyanite, plagioclase and K-feldspar. The coarse-grained areas contain large recrystallized quartz grains and ribbons, biotite, porphyroblastic muscovite with relict kyanite and plagioclase inclusions (Plate 6.16) and porphyroblastic garnet. Garnet is up to 7000 μm in diameter and contains inclusions of sub-millimetric quartz, biotite, apatite, pyrite, and rutile. Garnet is rimmed by biotite, muscovite, pyrite, chalcopyrite and plagioclase (Plate 6.17). Large apatite grains occur adjacent to the garnet and as inclusions in matrix biotite. The fine-grained areas contain quartz, biotite and muscovite, as well as abundant biotite + quartz + muscovite intergrowths (Plate 6.18).

Interpretation

As with samples from slices #1 and #2, all samples display evidence of partial melting in the kyanite field. The absence of primary muscovite and the presence of K-feldspar and kyanite indicate that *P-T* conditions for dehydration melting of white mica by [R1] or [R1a] were exceeded and the rocks have entered the *P-T* field of biotite dehydration melting by the reaction [R2] (Figures 2.6 and 2.7). The latter is supported by textural evidence of kyanite partially replaced by K-feldspar (Plate 6.12). In this context, coarse-grained alkali-feldspar + quartz domains in sample 207 (Plates 6.1 and 6.2) are interpreted as leucosome, fine-grained biotite + muscovite + quartz intergrowths (Plate 6.15) in sample 208 are related to melt crystallization, while large quartz ribbons are interpreted as solid residuum. In addition, K-feldspar + albite + quartz aggregates included throughout the core of the garnet porphyroblast of sample 207 (Plate 6.5; see Figure 6.4 for areas of high Na and K in core) are interpreted as trapped melt pockets, suggesting that this garnet began growing in the presence of melt.

Kyanite + biotite aggregates wrapping around garnet porphyroblasts from sample 207 (Plate 6.4), as well as biotite and quartz embayments in some of these porphyroblasts (Plate 6.6), are consistent with melt crystallization during cooling in the field of reaction [R2]. In addition, biotite + muscovite + quartz intergrowths (Plate 6.17) and muscovite porphyroblasts enclosing relict kyanite and plagioclase (Plate 6.16) are consistent with continuation of melt crystallization across reaction [R1] with final crystallization in the muscovite stability field.

6.2 MINERAL COMPOSITIONS

6.2.1 Garnet

Chemical zoning of the largest garnet porphyroblast in each sample was investigated by means of rim to rim traverses (Figures 6.1, 6.2, 6.5, 6.6, 6.7, 6.9, 6.10) and X-ray maps (garnet from sample 207 and 282 only) (Figures 6.3, 6.4, 6.8). Garnet porphyroblasts from samples 282 and 207 have similar compositions (Sps_{1-2} , Grs_{8-16}, Alm_{64-75}, and Prp_{16-24}), whereas the porphyroblast from sample 208 contains a greater amount of Sps and less Alm (Sps_{2-11} , Grs_{10-16}, Alm_{59-66}, and Prp_{12-24}) (Table 6.1, Tables 3.9a to 3.15a - Appendix 3).

Garnet porphyroblasts have chemically homogeneous cores and zoned rims with the exception of a porphyroblast from sample 282 that displays weak zoning with two bands parallel to the internal fabric, relatively enriched in Grs and Prp and separated by a band richer in Alm (see Figure 6.8). In garnet from sample 207, zoning is developed in the inclusion-free rims and is mainly characterized by a sharp outward increase in Grs up to 12-16% followed by a Grs decrease at the outer rims to 1-9% (Figures 6.1a and 6.2a). The Grs rim zoning is compensated by increases in Alm (Figure 6.2a) and to a lesser extent, Prp (Figure 6.1a) with X_{Fe} increasing slightly only at the outermost of Rim C (Figure 6.2a). The abundance and distribution of crystallized melt inclusions in the form of K-feldspar + albite + quartz aggregates included in garnet (see section 6.1.1) are well displayed in the compositional maps of Figure 6.4.

Rim zoning in garnet from samples 282 and 208 (Figures 6.5a, 6.6a, 6.7a, 6.9a and 6.10a) is characterized by an overall: (a) increase in Alm and decrease in Prp except for a rim adjacent to another garnet prophyroblast that is devoid of zoning (Figure 6.5a), and (b) smooth decrease in Grs, which in the case of garnet from sample 208 is followed by relatively constant Grs at the outer rims (Figure 6.9a and 6.10a). In addition, garnet rims from sample 208 display a marked increase in Sps (3%→8-11%) (Figures 6.9a and 6.10a).

Trace element zoning of the garnet from sample 207 is best displayed along traverse A-B (Figure 6.1b) and includes: (a) a bell shaped outward decrease in Y in the inclusion bearing core with a less steep gradient at the rims; (b) relatively high P contents in the Ca-enriched rims and (c) outward increase in Cr in most inclusion-free rims, locally followed by a decrease at the outer rims. Small Ti peaks are spurious, and appear to be associated with rutile and biotite inclusions (Figure 6.1b and 6.2b). In the case of garnet from sample 282, P and Ti mimic Grs zoning, and Cr increases at some rims (Figures 6.5b and 6.6b). Garnet from sample 208 displays an increase in Cr towards the rims, especially along transect A-B (Figure 6.9b), and a sharp increase of Y and P at a rim that is extensively corroded by biotite (Figure 6.10b). Sc displays a bell-shaped profile with an increase at the outer rims, especially those with rims which have the highest increase in Mn content (eg. rim D) (Figure 6.10b) implying resorption.

Interpretation

(A) Garnet from sample 207

Garnet from sample 207 consists of an inclusion-rich core surrounded by a virtually inclusion-free rim implying two stages of growth (Plate 6.4). The homogeneous composition of the core could be due to diffusional homogenization or to fast growth at constant composition. The second stage of growth is represented by the Ca-enriched and virtually inclusion free-rim (Figure 6.1a, 6.2a and 6.3a). Grs highs locally coincide with P and Cr highs (Figures 6.1b and 6.2b).

Unlike all other analysed samples, the ameboid inclusions of quartz + albite + K-feldspar aggregates in the core of this porphyroblast (see section 6.1.1) provide firm evidence that growth of the core occurred in the presence of melt. In this context, Grs and locally P- enriched rims (Figure 6.1 to 6.3) may be due to either breakdown of apatite during the growth of the rims, or to a hiatus in garnet growth while melt was still being produced. The first case implies growth of the entire garnet in the *P-T* field of the reaction Bt + Ky + Ab + Qtz = Grt + Kfs +L ([R2], Figure 2.7), i.e. at temperatures above the stability field of white mica. The second case is consistent with growth of the garnet core by the continuous reaction Phe + Bt + Ab = Grt + Kfs + L ([R3], Figure 2.7), interrupted by the discontinuous reaction Grt + Phe + (Ab) + Qtz = Bt + Ky + Kfs + L ([R_{II}], Figure 2.7), which consumes garnet, with subsequent growth of the rims by reaction [R2] (Indares and Dunning 2001; Figure 2.6, see section 2.3.2.5). This case is supported by Cr-enrichment in some of the rims and is consistent with P-enrichment at the rims. This is because, partial consumption of garnet by reaction [R_{II}] would release P from garnet to the immediate matrix producing secondary phosphates and a local reservoir enriched in P. Upon renewal of garnet growth by reaction [R2], this P would become reincorporated into the new garnet rims.

The decrease in Grs at the outermost rims that display constant or increasing X_{Fe} (Figure 6.1a) may be considered a growth feature, attributed to progressive depletion of the available An during further garnet growth. This porphyroblast is the only one from this thrust slice to show preserved growth zoning at the rims. In contrast, the slight increase in X_{Fe} at the rim that is overgrown by biotite (Figure 6.2a) is likely due to retrograde Fe-Mg exchange between garnet and the biotite. The bell-shaped outward decrease in Y (Figure 6.1b and 6.2b) is typical of garnet growth in the presence of an Y bearing phase although it is not commonly observed in garnet growing in the melt domain. The small Ti peaks in the middle of the garnet are probably linked to biotite and rutile inclusions while the overall Ti increase at the rims may indicate participation of biotite in the melting reaction.

(B) Garnet from sample 282

The garnet porphyroblast from sample 282 displays Grs (and minor Prp and Alm) zoning parallel to the internal fabric (Figure 6.8a, 6.10a). This is consistent with element diffusion being facilitated in this direction or overprinting of the existing element distribution in a precursor layering (Yang and Rivers, 2001). Overprint zoning implies relatively fast growth which is consistent with the incorporation of numerous inclusions. If zoning is solely the result of overprinting it would not be appropriate to ascribe any *P-T* significance to it. However, it may also be possible that a portion of the Ca was supplied by the breakdown of An by reaction [R2] (Figure 2.7). This is supported by the abundant rutile inclusions in the garnet porphyroblasts (Plates 6.8 and 6.9), which may have formed as a result of the breakdown of a Ti-rich phase such as biotite or ilmenite during [R2] because Ti is not partitioned into the melt.

Increasing X_{Fe} in most garnet rims, and especially those adjacent to biotite (Figure 6.5a), is attributed to retrograde Fe-Mg exchange between garnet and adjacent biotite during cooling. The increases in Ti and Cr towards the rims (Figures 6.5b, 6.6b and 6.7b) are consistent with garnet growth at the expense of biotite.

(C) Garnet from sample 208

Chemical homogeneity of Grs in the core of sample 208 (Figures 6.9a and 6.10a) and extensive diffusion zoning associated with resorption (i.e. increased Sps and X_{Fe}) at the rims, hamper interpretation of the growth history of these porphyroblasts. Lack of Grs-enriched rims, which are typical of growth in the presence of melt may be explained by: (a) chemical homogenization under high temperature; (b) growth of the entire garnet by reaction [R2] (Figure 2.7) ; or (c) destruction of the Grs-enriched rims by resorption. Growth of the entire garnet by reaction [R2] is the favored interpretation since this sample contains abundant melt-related textures. Retrograde zoning is consistent with garnet breakdown by reaction [R2] operating in the reverse sense during cooling, coupled with Fe-Mg exchange between garnet and biotite.

6.2.2 Biotite

Biotite from all three samples is Fe-rich (Table 6.2, Tables 4.4 to 4.6 - Appendix 4). X_{Fe} values cover narrow compositional ranges (sample 207: X_{Fe} = 0.47-0.50, Figure

6.11a; sample 208: $X_{Fe} = 0.45\text{-}0.58$, Figure 6.11b; and sample 282: $X_{Fe} = 0.47\text{-}0.58$, Figure 6.12) and show no significant trends between microtextural domains (Figure 6.11 and 6.12). Individual grains are homogeneous except for three grains included in garnet (sample 282), one of which shows an outwards increase in X_{Fe} (0.45→0.52) while the other two show an outwards decrease in X_{Fe} (0.45→0.42, 0.49→0.46), and two grains adjacent to garnet which show an outwards increase in X_{Fe} (sample 208: X_{Fe} = 0.47→0.53, 0.52→0.55). Local highs of X_{Fe} in some biotite adjacent to garnet are consistent with retrograde growth of biotite by a net transfer reaction such as reaction [R2] (Figure 2.7) in the reverse direction, whereas X_{Fe} lows in the same textural settings indicate that Fe-Mg exchange between garnet and biotite continued after the blocking of the net transfer reaction. General homogeneity of matrix biotite in terms of X_{Fe} is consistent with pervasive diffusion of Fe and Mg, probably during melt crystallization.

Ti contents in biotite range between 0.15 and 0.21 p.f.u in sample 207, 0.13-0.25 p.f.u. in sample 282 and 0.09 and 0.20 p.f.u. in sample 208. Ti contents are lowest in grains included in garnet (samples 208 and 282) and in some grains adjacent to garnet (sample 282). Since Ti content of biotite is known to increase with temperature, low Ti in grains included in garnet is consistent with growth during early stages of the prograde path, whereas low Ti in grains adjacent to garnet suggests retrograde growth at temperature conditions lower than those of the matrix biotite away from garnet (see section 2.4.3.2). Since Al^{VI} occupies the same site as Ti in the biotite lattice, there is an inverse correlation between them in biotite from all samples (Figures 6.13c, 6.14c, 6.15c).

6.2.3 Feldspar

Analysed feldspar includes: (a) plagioclase adjacent to (and in cases replacing) garnet and plagioclase isolated in the matrix; and (b) feldspar aggregates included in garnet (sample 207) and (c) alkali-feldspar in the matrix (sample 207) (Table 1.1 - Appendix 1).

6.2.3.1 Plagioclase

Plagioclase is most abundant in sample 207, where its An content ranges between 27 and 32% (Table 6.3, Tables 5.4 and 5.5 - Appendix 5). Only two grains from this sample are zoned with one showing an outwards increase in An (29%→33-35%, Figure 6.17.a), and the other showing a decrease in An (36%→35-32%). Plagioclase is more An-rich in sample 208 (35-51%) with only one grain showing a decrease in An (49%→46 - 43%, Figure 6.17b). Plagioclase is rare in sample 282 with only one sub-millimetric grain being identified. The outward increase in An towards the rims of some plagioclase can be attributed to the post-peak transfer of Ca from garnet to plagioclase during retrogression. This is consistent with resorption of garnet along some rims.

6.2.3.2 Matrix alkali-feldspar and feldspar aggregates included in garnet

The feldspar included in garnet (Plate 6.5) consists of an intergrowth of a wide range of plagioclase and alkali-feldspar solid solutions from almost pure albite to mixtures of albite and anorthite to pure K-feldspar. Some analyses also show all three components being present in significant proportions indicating a ternary feldspar (example $Ab_{65}An_{36}Or_{18}$). Intergrown with the feldspar is an alteration material which has a dark, gritty appearance on the back scatter images and yields low oxide totals of ~85% upon analysis. Extensive alteration of the melt inclusions in garnet is probably due to the H_2O released during melt crystallization which also became trapped inside the garnet forming a hydrous alteration product. The alkali-feldspar grains isolated in the matrix show variable degrees of exsolution, but appear to generally consist of about 66% plagioclase host with 34% exsolved orthoclase. The presence of ternary feldspar in the melt inclusions as well as extensive exsolution of alkali-feldspar in the matrix indicates high metamorphic temperatures followed by relatively slow cooling.

6.2.4 Muscovite

The muscovite analysed from sample 31A has a composition close to that of ideal muscovite, with only minor Na and subordinate Fe and Mg contents and a slight Si (Table 6.4, Table 6.3 - Appendix 6) excess over the ideal Si content, suggesting only minor paragonite and phengite components.

6.3 SUMMARY AND *P-T* CONSTRAINTS

6.3.1 Summary

Samples 207, 208 and 282 from thrust slice #3 (Figure 1.2) display features consistent with dehydration melting of micas in the kyanite stability field:

(1) Mineral assemblage and textures

The absence of primary white mica and the presence of K-feldspar and kyanite indicate that the conditions for dehydration melting of white mica were exceeded in all samples and rocks reached the *P-T* field of biotite dehydration melting (reaction [R2], Figure 6.15a - segment A). In addition, the K-feldspar + albite + quartz aggregates included in the garnet porphyroblast of sample 207 (Plate 6.5) are interpreted as crystallized melt pockets suggesting that this garnet began growing in the presence of melt.

(2) Garnet zoning

In contrast to samples from the other thrust slices, the presence of K-feldspar + albite + quartz inclusions throughout the inclusion-rich core of the garnet porphyroblast from sample 207 (Plate 6.4) indicate that the entire garnet grew in the melt domain, (see above). However, Ca- (and locally P) enrichment in the rims (Figures 6.1b and 6.2b) suggests a discontinuity in the growth history that can be best explained by a reaction sequence involving dehydration of phengite. According to this sequence, garnet may have started growing by the reaction Phe + Bt + Ab = Grt + Kfs + L ([R3], Figure 2.6), then crossed the reaction Grt + Phe + Ab + Qtz = Bt + Ky + Kfs + L ([R_{II}]), which produces melt by consuming garnet and white mica, with renewed garnet growth subsequently occurring by the reaction Bt + Ky + Ab + Qtz = Kfs + Grt + l ([R2], Figure 2.6; see section 2.3.2.5; Indares and Dunning 2001). Therefore, following this interpretation, sample 207 is the only one that provides evidence for dehydration melting of phengite.

Despite the lack of Grs-enriched rims, the analyzed garnet from sample 208 (Figure 6.9a and 6.10a) may have grown completely in the melt domain on the basis of the abundance of melt-related textures in this sample. The effect of partial melting on the composition of garnet from sample 282, on the other hand, may be masked by overprinting of the existing element distribution in the precursor layering (overprint zoning, Yang and Rivers 2001) leading to a Ca-enriched central band (Figure 6.8a). Dehydration melting of biotite during garnet growth is further supported by an increase in Ti (Figure 6.5b and 6.7b) and Cr (6.5b and 6.6b) towards the rims of the garnet and possibly by the presence of numerous rutile inclusions.

In addition, there are textural features related to melt crystallization. Late biotite and kyanite grains wrapping around the largest garnet porphyroblast of sample 207 (Plate 6.4), as well the biotite and quartz grains embaying the smaller porphyroblasts (Plate 6.6), are consistent with reaction [R2] operating in the reverse sense during melt crystallization (Figure 6.15a - segment B). Biotite + muscovite + quartz intergrowths (Plate 6.17) and muscovite porphyroblasts enclosing relict kyanite and plagioclase (Plate 6.16) in sample 208 are consistent with final melt crystallization in the muscovite stability field by reaction [R1] operating in the reverse sense (Figure 6.15a). Extensive retrogression may account for the scarcity of K-feldspar in sample 208, because K-feldspar is a reactant in both reactions [R1] and [R2] operating in the reverse sense during cooling. The abundance of disequilibrium textures involving biotite in all samples suggests that most biotite is secondary in origin, produced by reaction [R2] operating in the reverse sense during cooling.

6.3.2 Further *P-T* Constraints

The *P-T* history of thrust slice #3 was further constrained using relevant X_{Fe}-garnet and GASP isopleths. GASP isopleths were calculated using: (a) Grs-enriched rims and a plagioclase core with maximum An from the matrix (sample 207); (b) the homogeneous garnet core and a plagioclase core with maximum An in sample 208, where garnet is devoid of Grs-enriched rims and is interpreted to have grown entirely by reaction [R2]; and (c) adjacent garnet and plagioclase rims in areas where garnet displays retrograde zoning (Table 7.1 - Appendix 7). In the first two cases, intersection of the GASP isopleths with reaction [R1] may constrain the onset of reaction [R2]. It should be noted that in the case of sample 207, where garnet grew entirely in the presence of melt, use of Grs-enriched rims is only valid if these rims surround a garnet that has been partially resorbed by reaction [R_{II}] (see section 2.4.1, Figure 2.6). In this case, the intersection with reaction [R1] can still be used because reactions [R1] and [R1a] are interpreted to occupy the same location in *P-T* space (Indares and Dunning 2001). Also in both cases, estimated pressure conditions should be viewed as maxima because plagioclase in equilibrium with garnet at the onset of reaction [R2] was likely more An-rich than the plagioclase present in the matrix, the latter being produced by melt crystallization. Finally, intersection of the third type of isopleths with reaction [R1] should yield the *P-T* conditions of melt crystallization (see section 2.4.3.3). GASP isopleths were not calculated in sample 282 owing to the rarity of plagioclase.

In addition, X_{Fe} of garnet was used to constrain: (a) the temperature conditions at the thermal peak; and (b) *P-T* conditions of melt crystallization (by intersection with reaction [R1]). For the first case, the X_{Fe} of garnet cores that are interpreted to have been homogenized in terms of Alm and Prp during peak conditions were used, whereas in the second case the X_{Fe} of retrograde garnet rims away from biotite were used (see section 2.4.3.2).

Intersection of reaction [R1] with relevant GASP isopleths defines a *P-T* range for the onset of reaction [R2] between 1140-1320 MPa and 750-770°C, and for the end of melt crystallization between 930 MPa (Sample 208) - 1070 MPa (Sample 207) and 722-740°C (Figure 6.15b). These conditions imply partial melting and melt crystallization at elevated pressures but without any important pressure variation between the prograde and retrograde portion of the path. The X_{Fe} isopleths yield temperatures between 725 °C (sample 207) - 748 °C (sample 208) for the thermal peak, and *P-T* conditions of 820 MPa and 710 °C (sample 207) for the end of melt crystallization. This implies partial melting in a very restricted *P-T* range close to the sillimanite stability field and final melt crystallization in the sillimanite field. The validity of these X_{Fe} isopleths is once again questionable as kyanite is the stable aluminosilicate phase in thrust slice #3, and there is textural evidence of extensive partial melting in the field of reaction [R2].

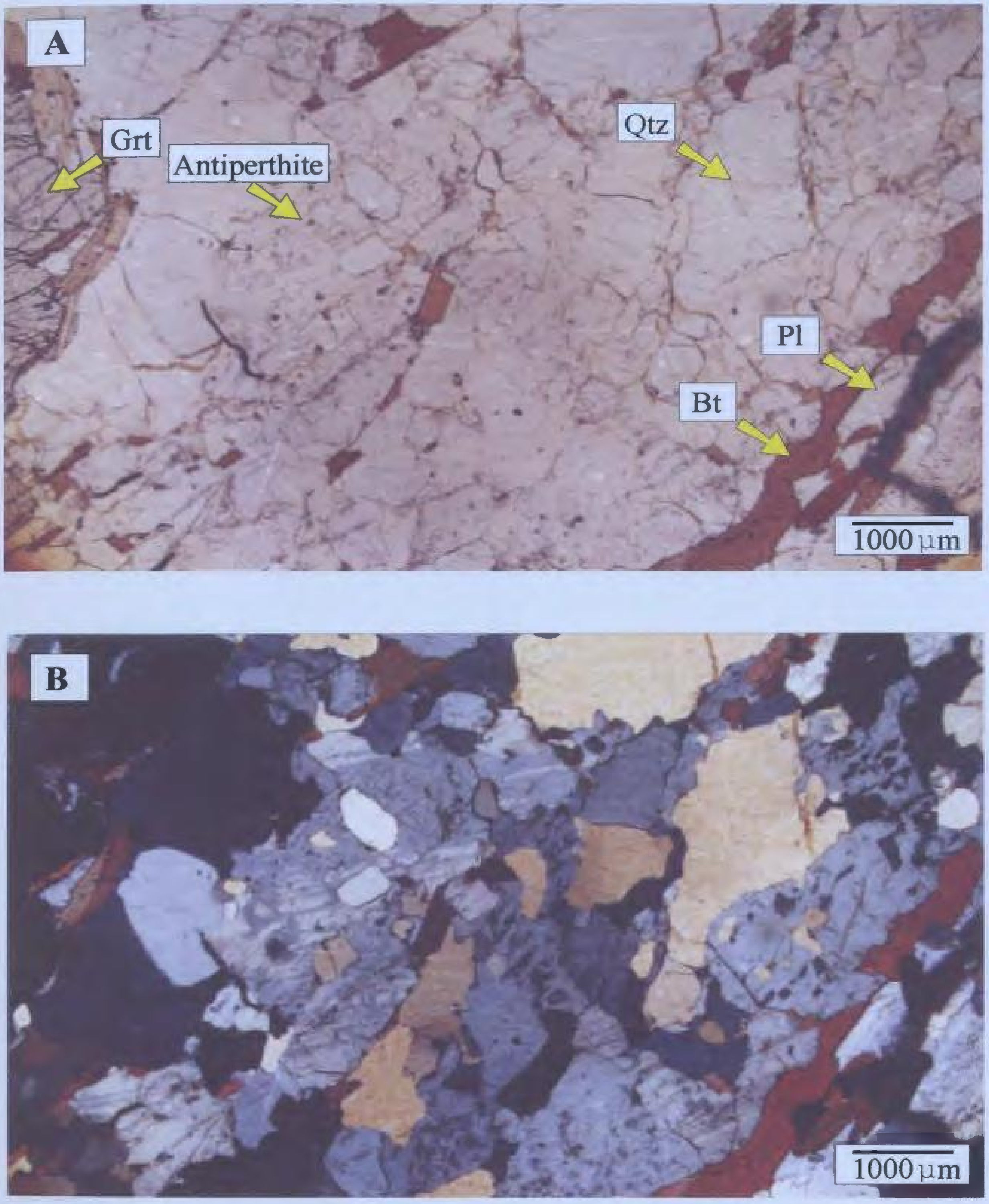


Plate 6.1: Quartzofeldspathic layer representing leucosome (sample 207). (A) plane polarized light and (B) cross polarized light.

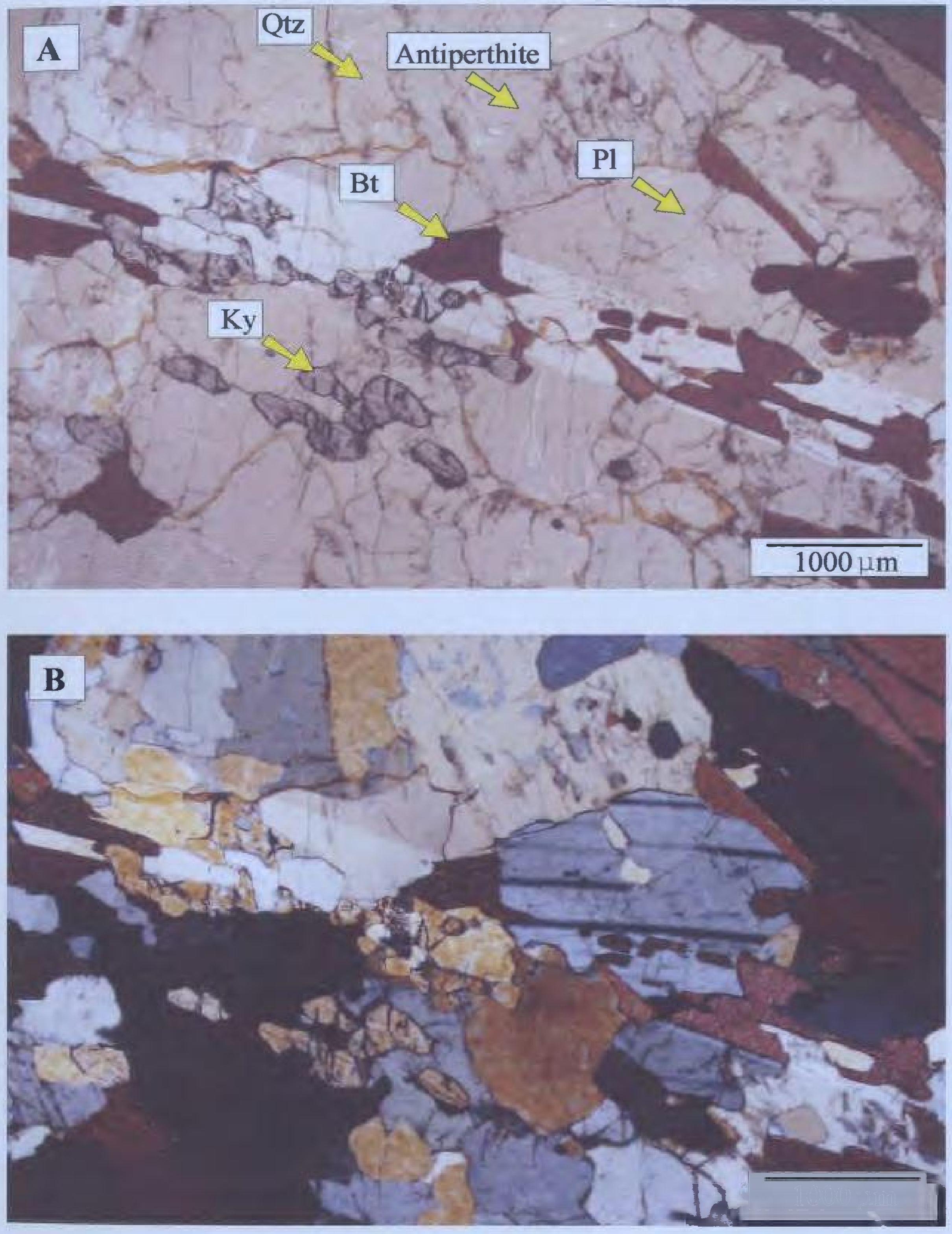


Plate 6.2: Quartzofeldspathic layer representing leucosome (sample207).
(A) plane polarized light and (B) cross polarized light.

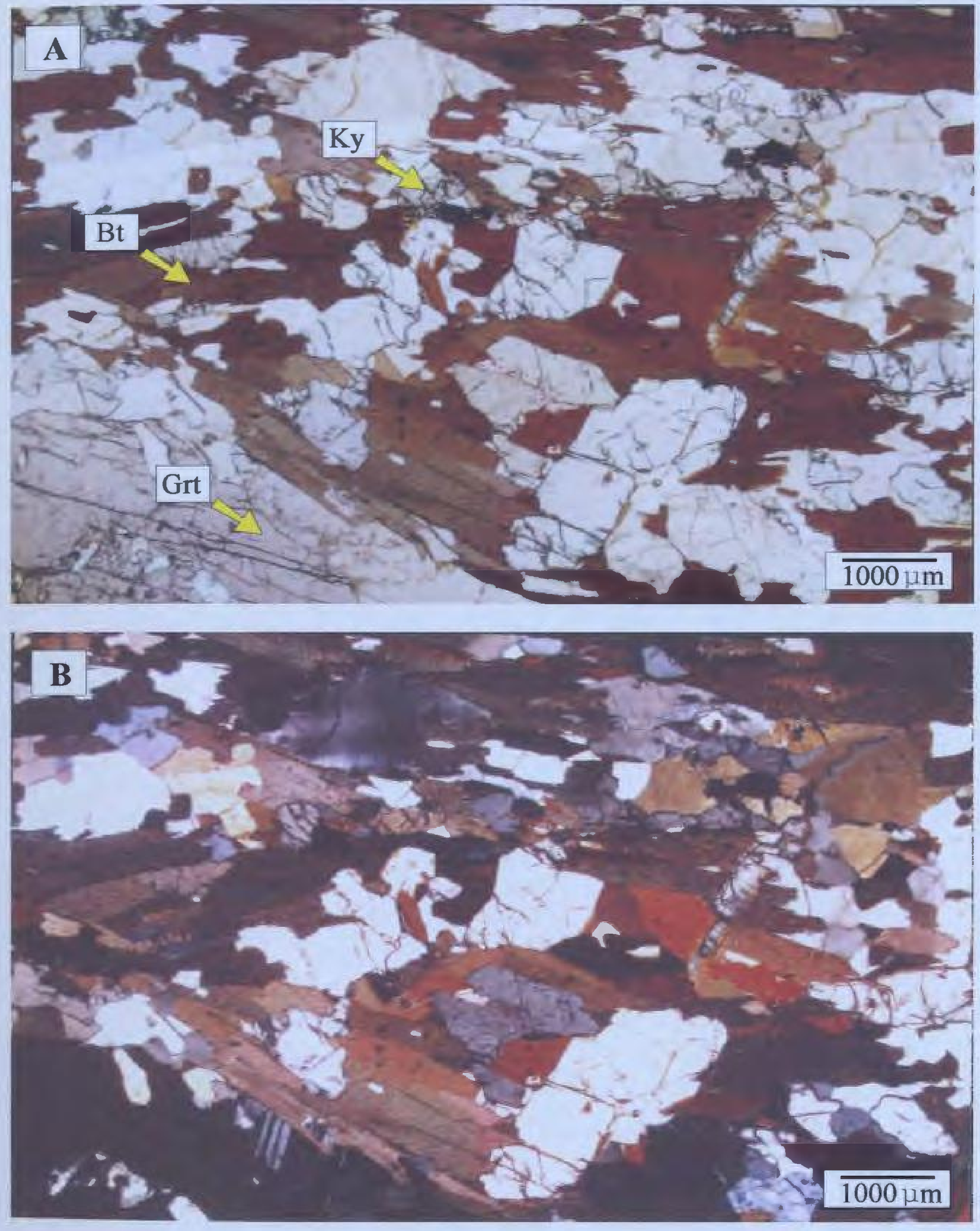


Plate 6.3: Layer dominated by biotite aggregates which are aligned parallel to the layering and wrap around the garnet porphyroblast in the bottom left corner (sample 207).

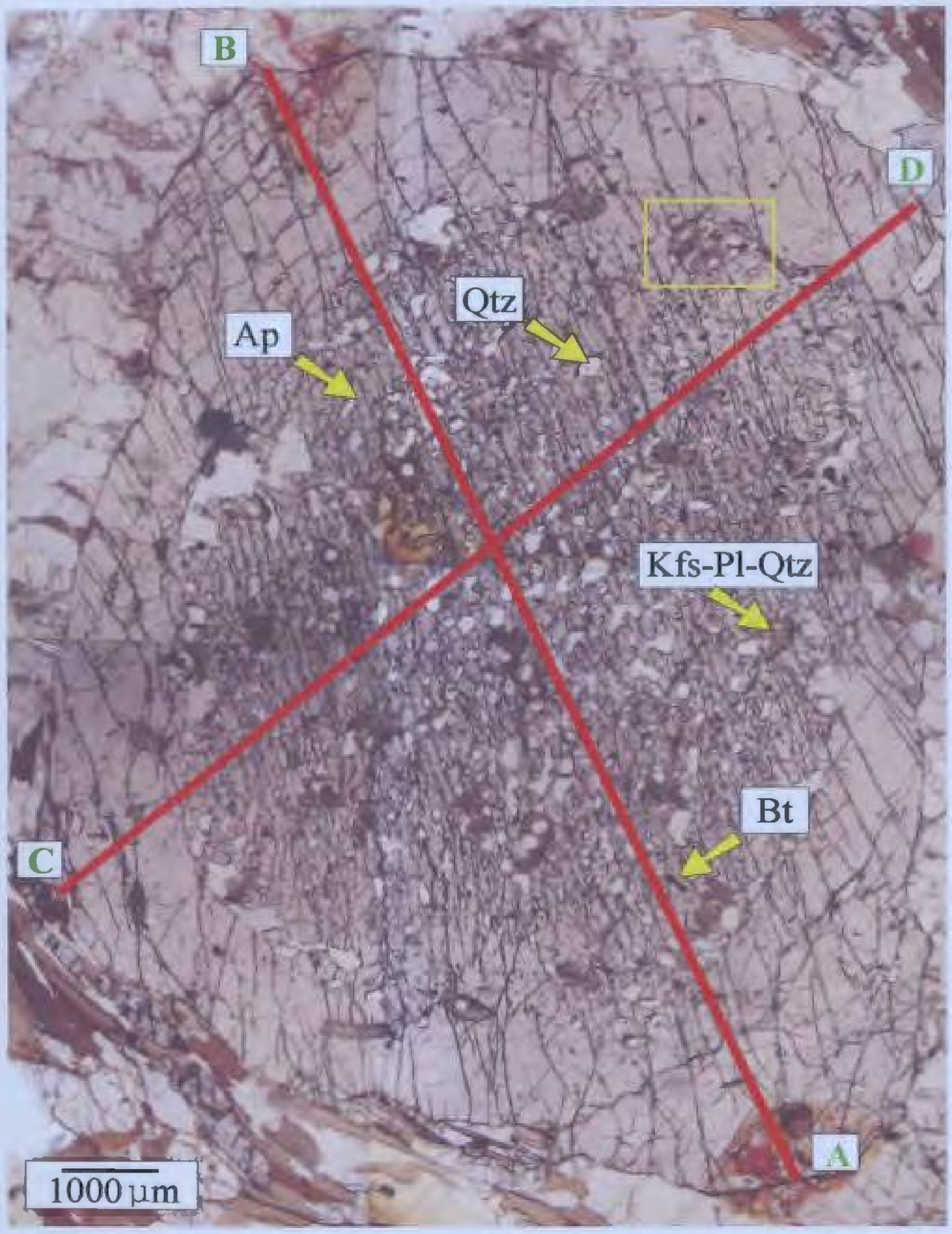


Plate 6.4: Garnet porphyroblast from sample 207. The core is rich in inclusions of quartz, apatite, variably altered K-feldspar + albite + quartz aggregates (interpreted as crystallized melt pockets) and minor biotite and is surrounded by an inclusion free rim. Lines A-B and C-D indicate paths of microprobe analysis. See Figures 6.1-6.4. Area outlined in yellow shows the location of Plate 6.5.

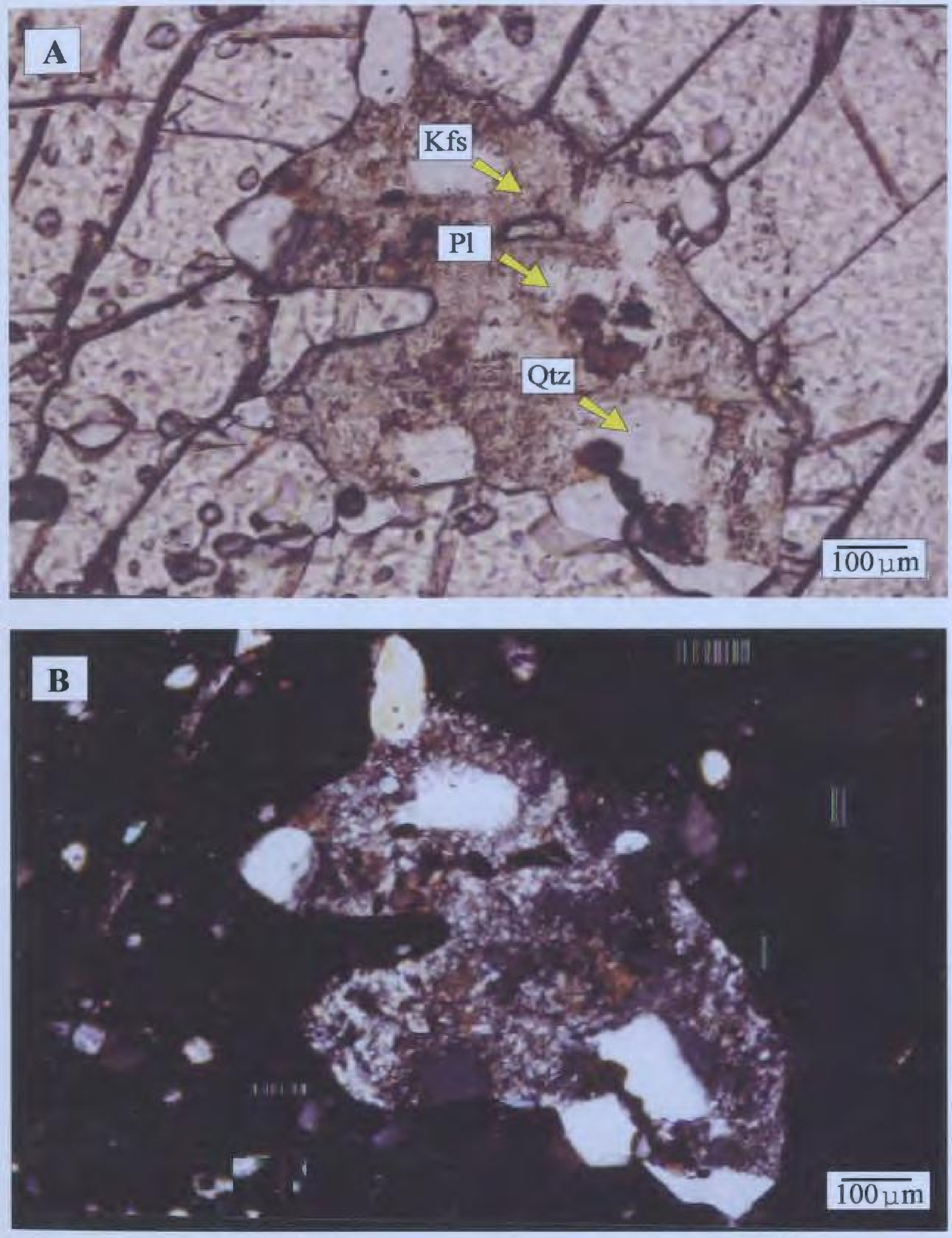


Plate 6.5: A variably altered K-feldspar + albite + quartz aggregate, interpreted to be crystallized melt, included in the core of the garnet porphyroblast from sample 207. (A) plane polarized light and (B) cross polarized light.

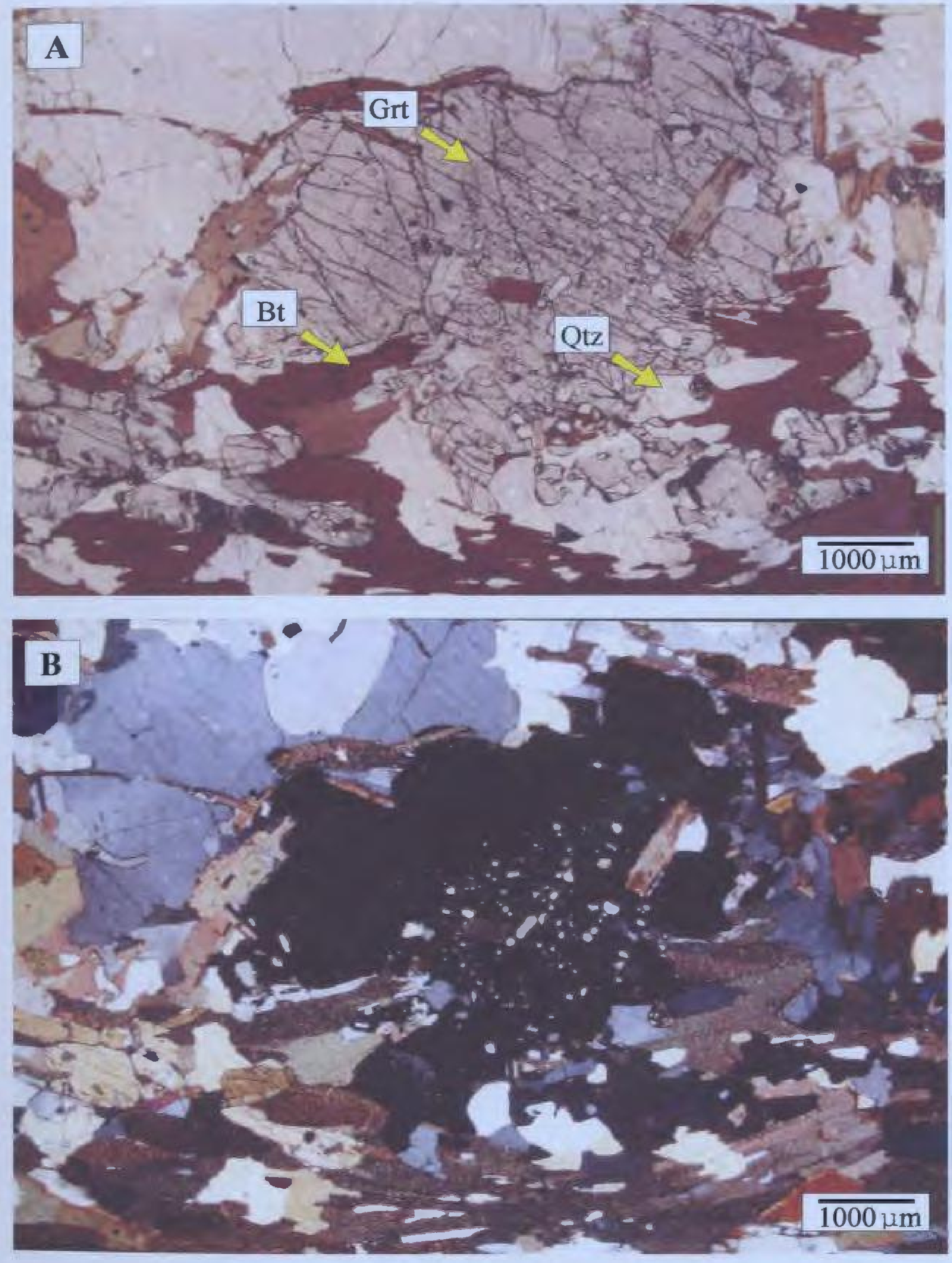


Plate 6.6: Garnet porphyroblast embayed by biotite and quartz which likely formed during melt crystallization (sample 207). (A) plane polarized light and (B) cross polarized light.

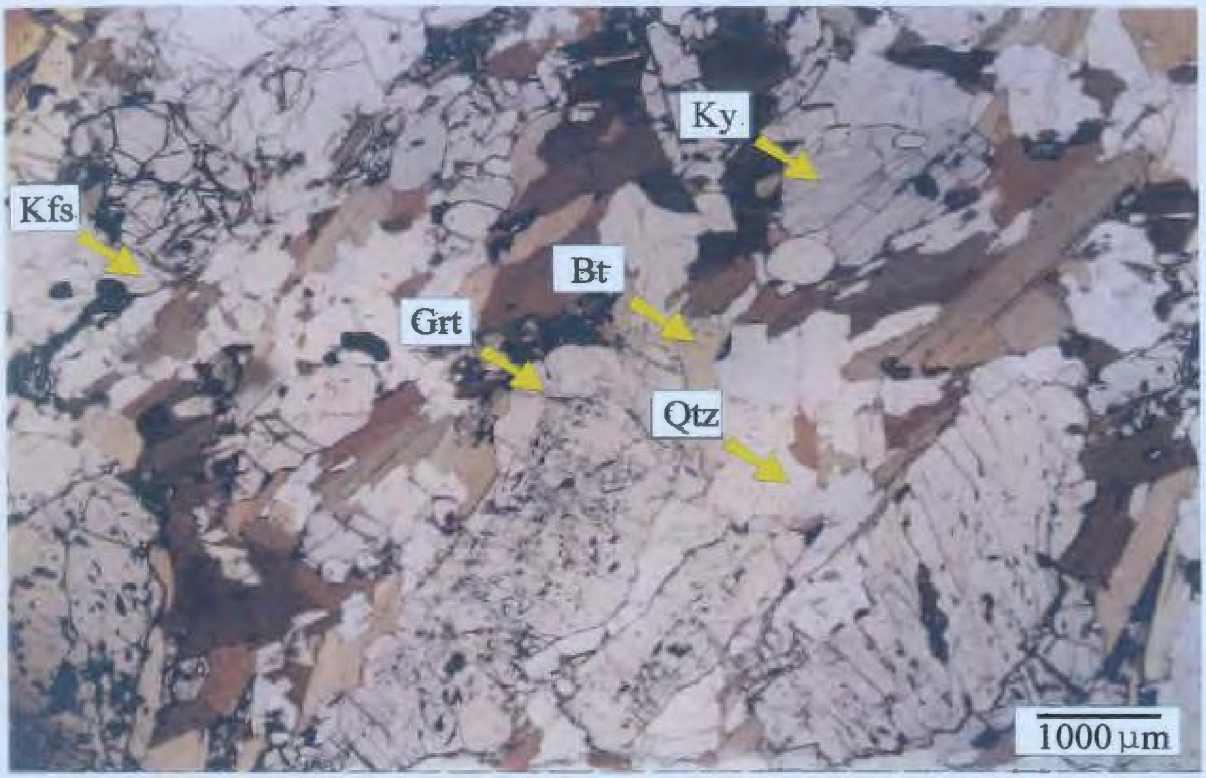


Plate 6.7: 'Fresh' portion of sample 282 (away from pseudotachylite).

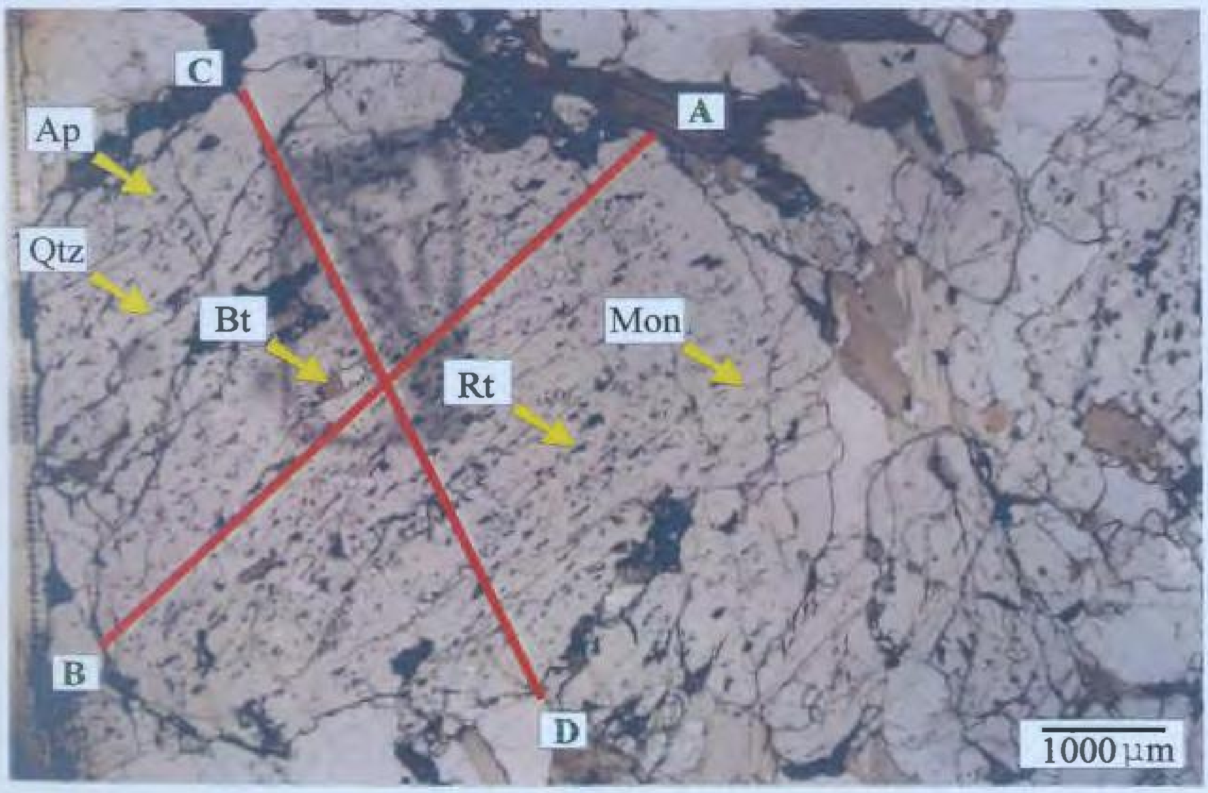


Plate 6.8: Garnet I from sample 282. Inclusions consist of quartz, biotite, rutile, apatite and monazite and define a strong internal fabric that cannot be traced into the matrix. Lines A-B and C-D indicate paths of microprobe analyses. (See Figures 6.5, 6.6 and 6.7).

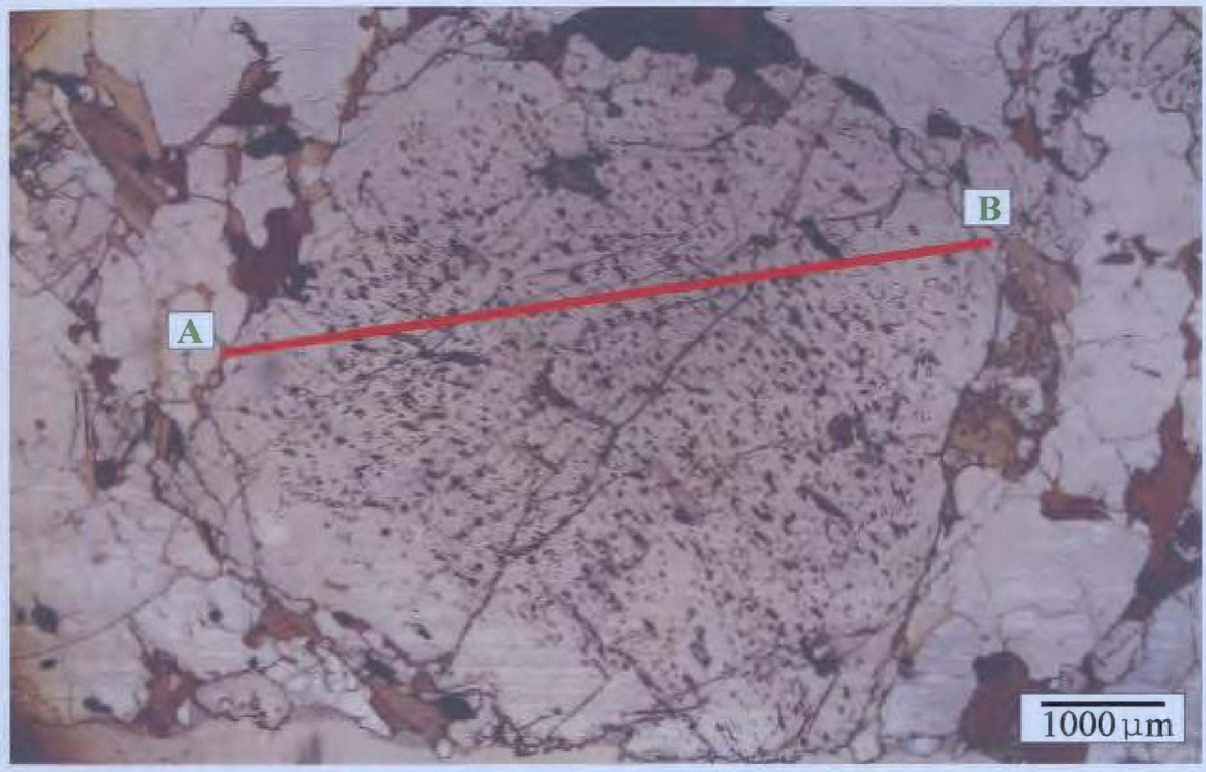


Plate 6.9: Garnet II from sample 282. Inclusion patterns are similar to those in Garnet I (Plate 6.8). Line A-B shows the path of microprobe analyses (See Figure 6.7).

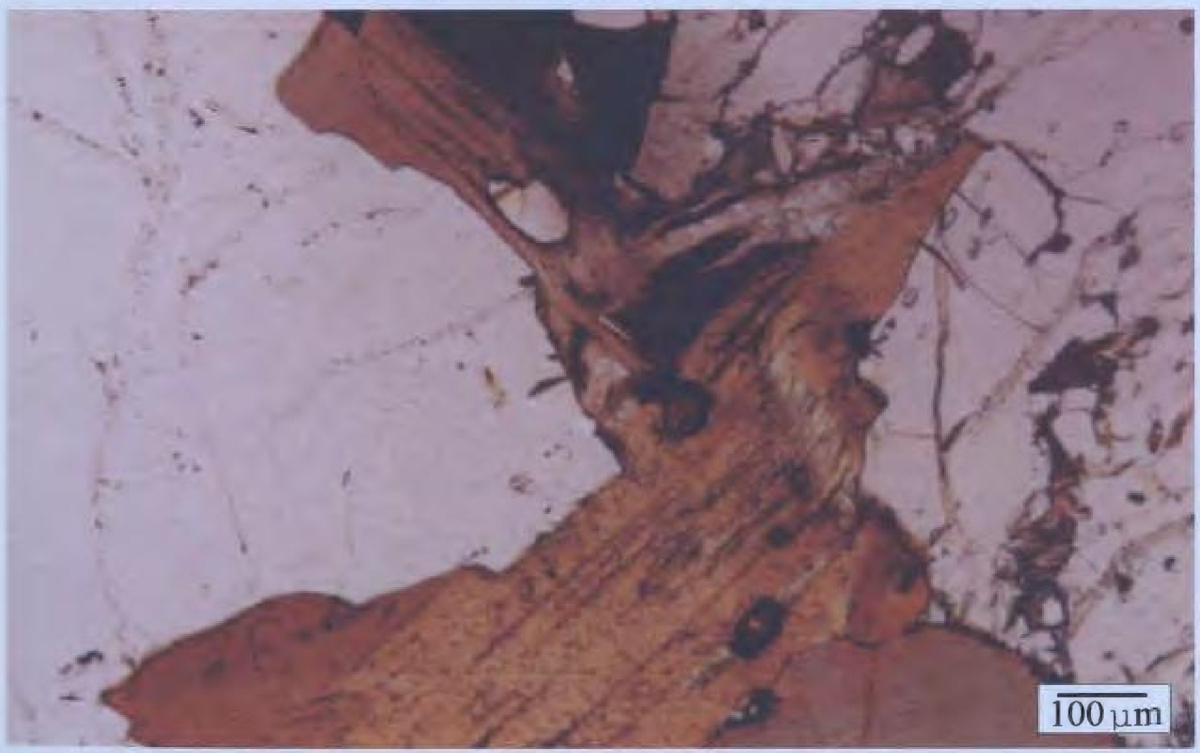


Plate 6.10: Biotite showing localized evidence of deformation (sample 282).

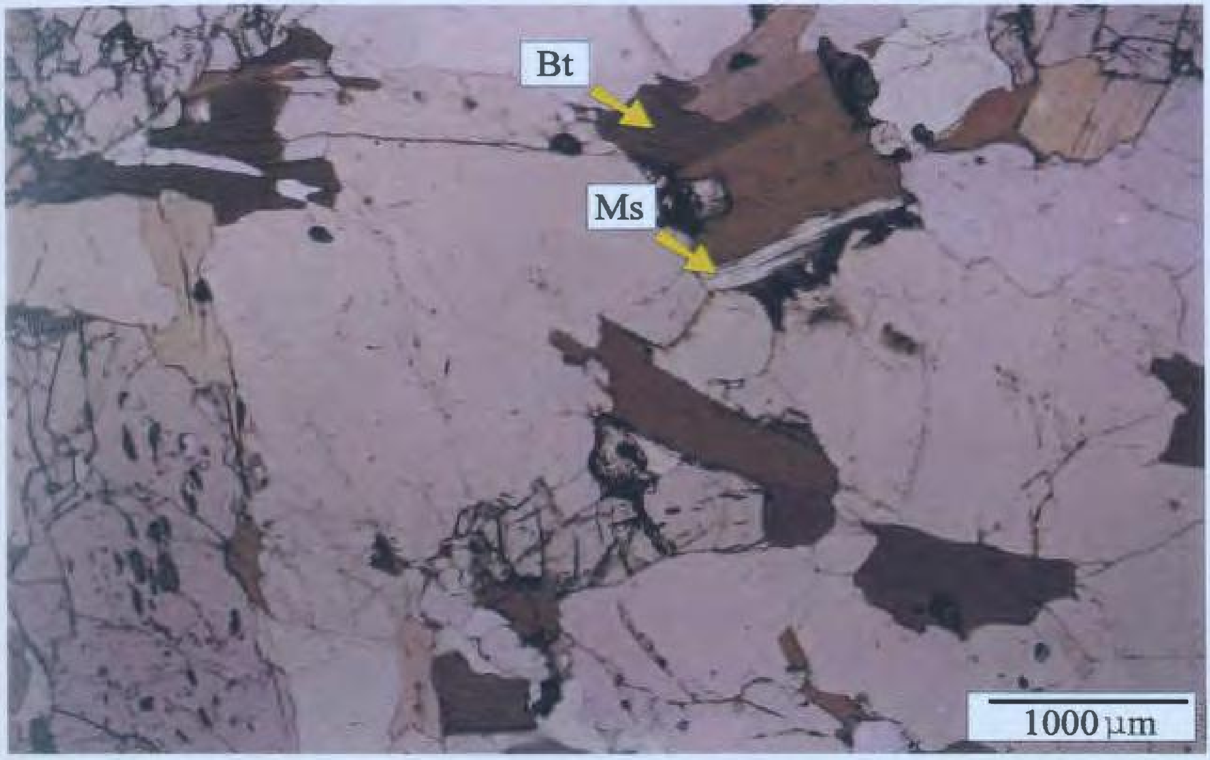


Plate 6.11: Biotite intergrown with muscovite, both of which were produced during melt crystallization (sample 282).

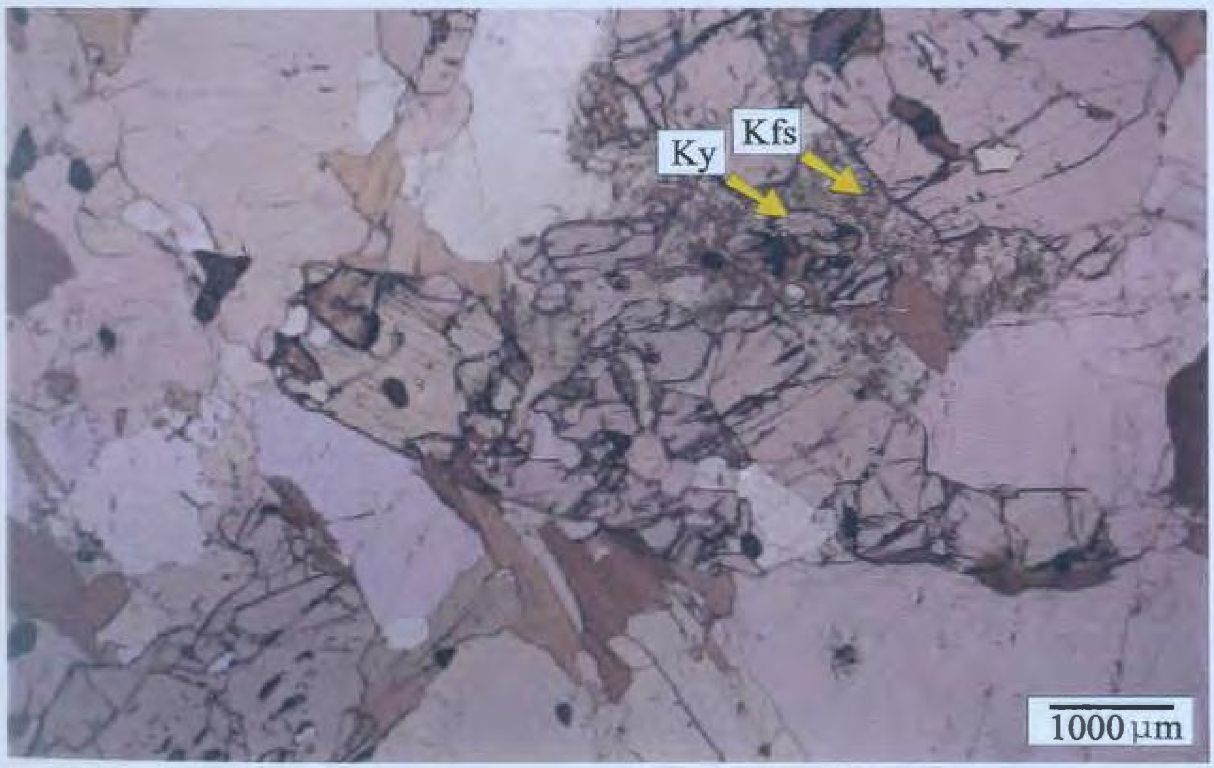


Plate 6.12: Kyanite locally surrounded and replaced by K-feldspar (sample 282).

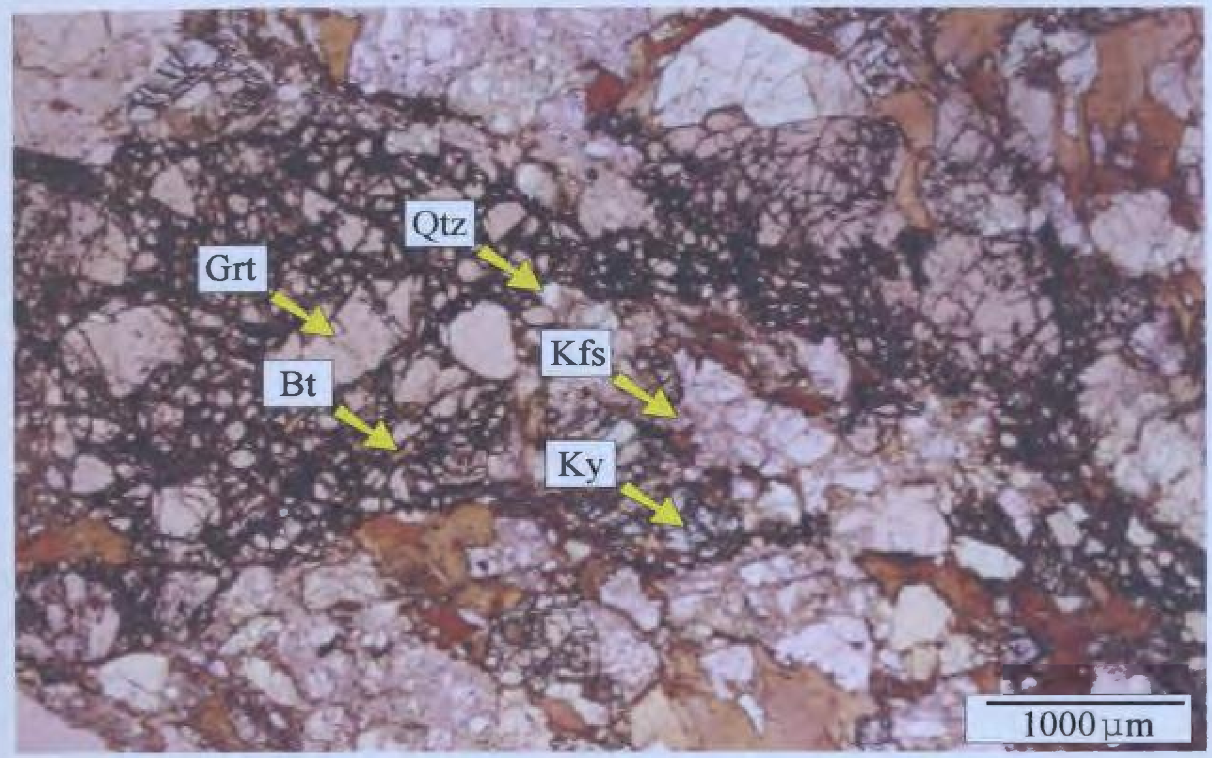


Plate 6.13: Areas of sample 282 showing brecciation textures associated with the Triassic Manicouagan Impact. Minerals are surrounded by a very fine-grained dark colored pseudotachylite.

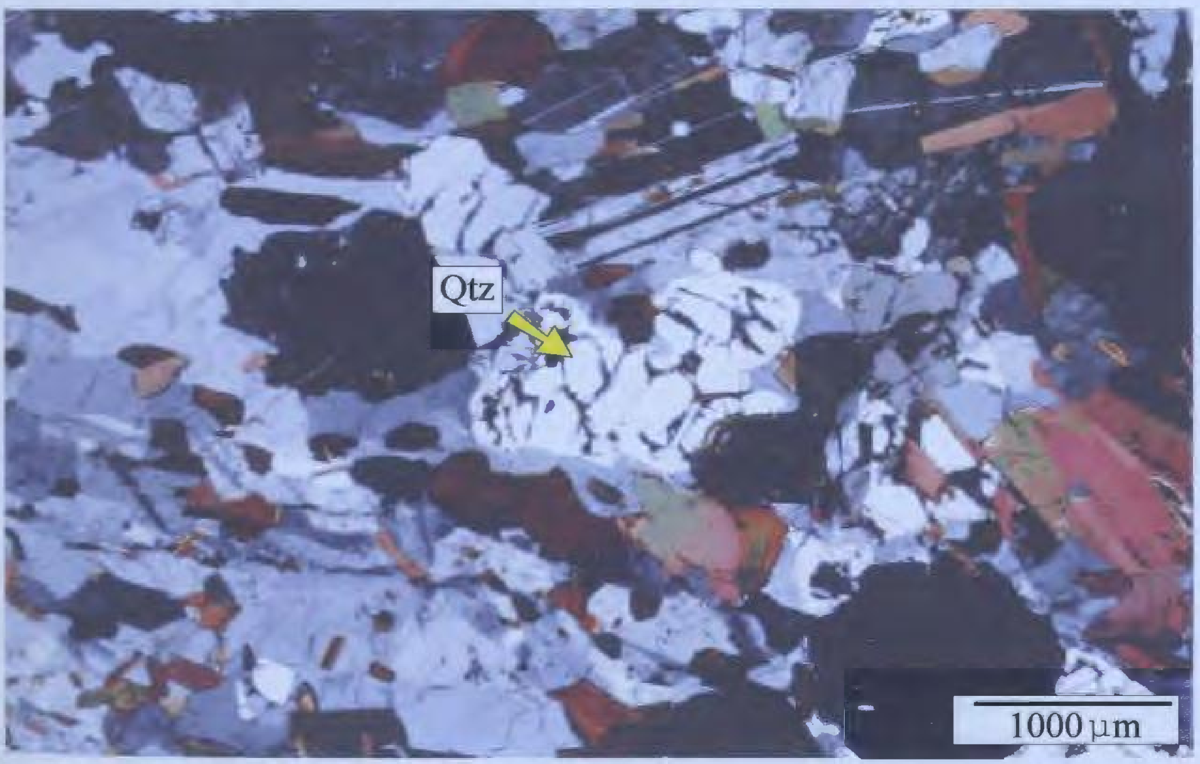
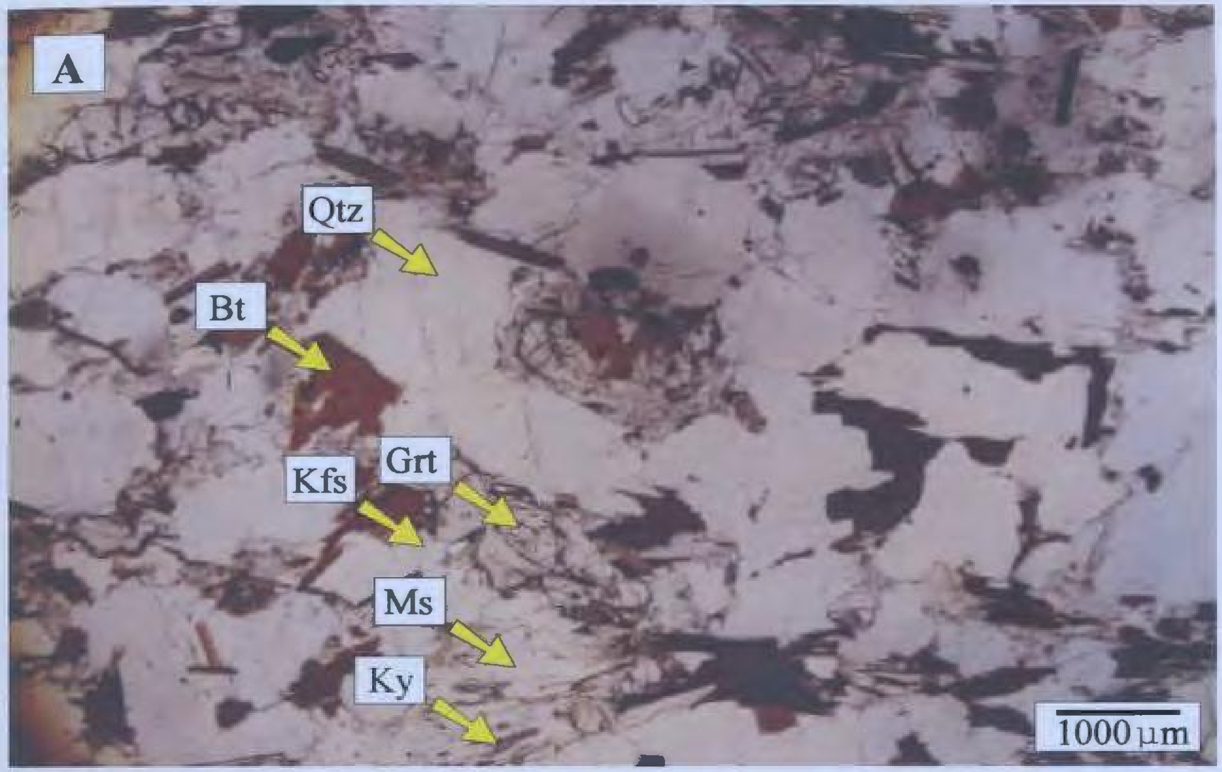


Plate 6.14: Quartz with a 'cracked' appearance which may also be associated with the Triassic Manicouagan Impact (sample 282).



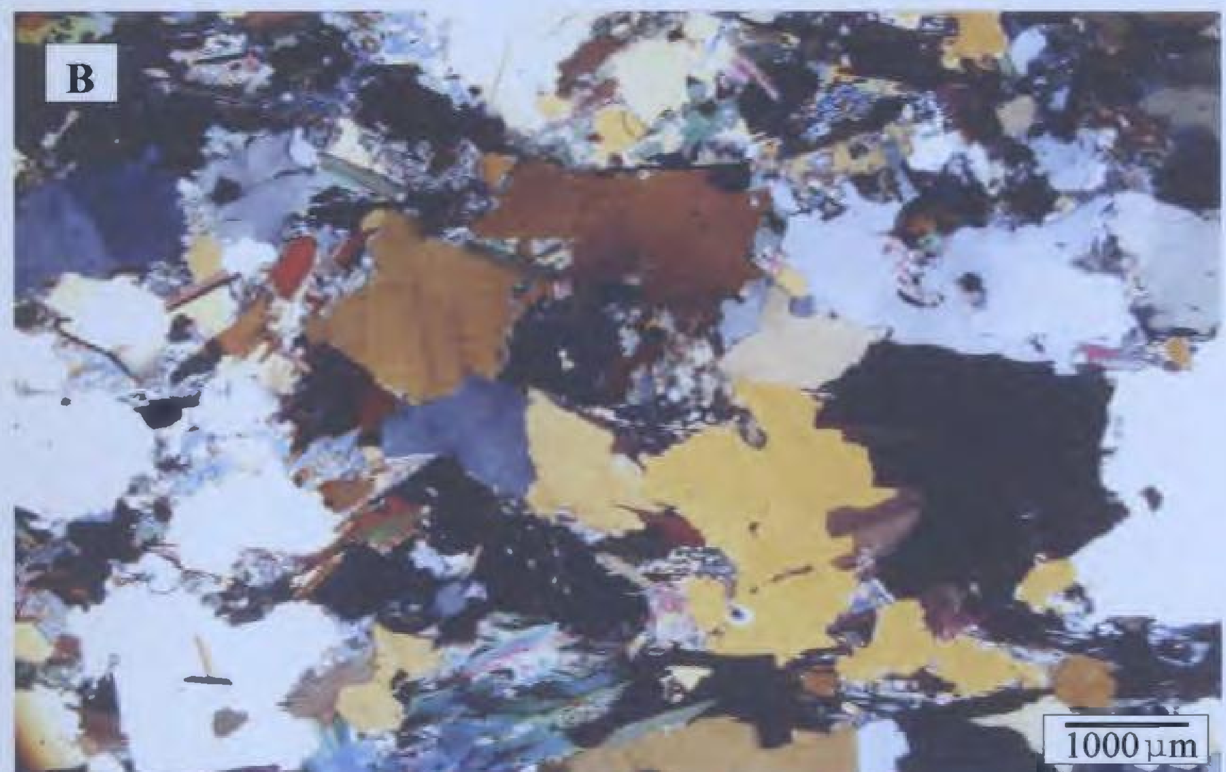


Plate 6.15: Coarse-grained areas dominated by large quartz grains, representing solid residuum, intermixed with fine-grained areas displaying numerous muscovite + biotite + quartz intergrowths which are probably related to melt crystallization (sample 208). (A) plane polarized light and (B) cross polarized light.

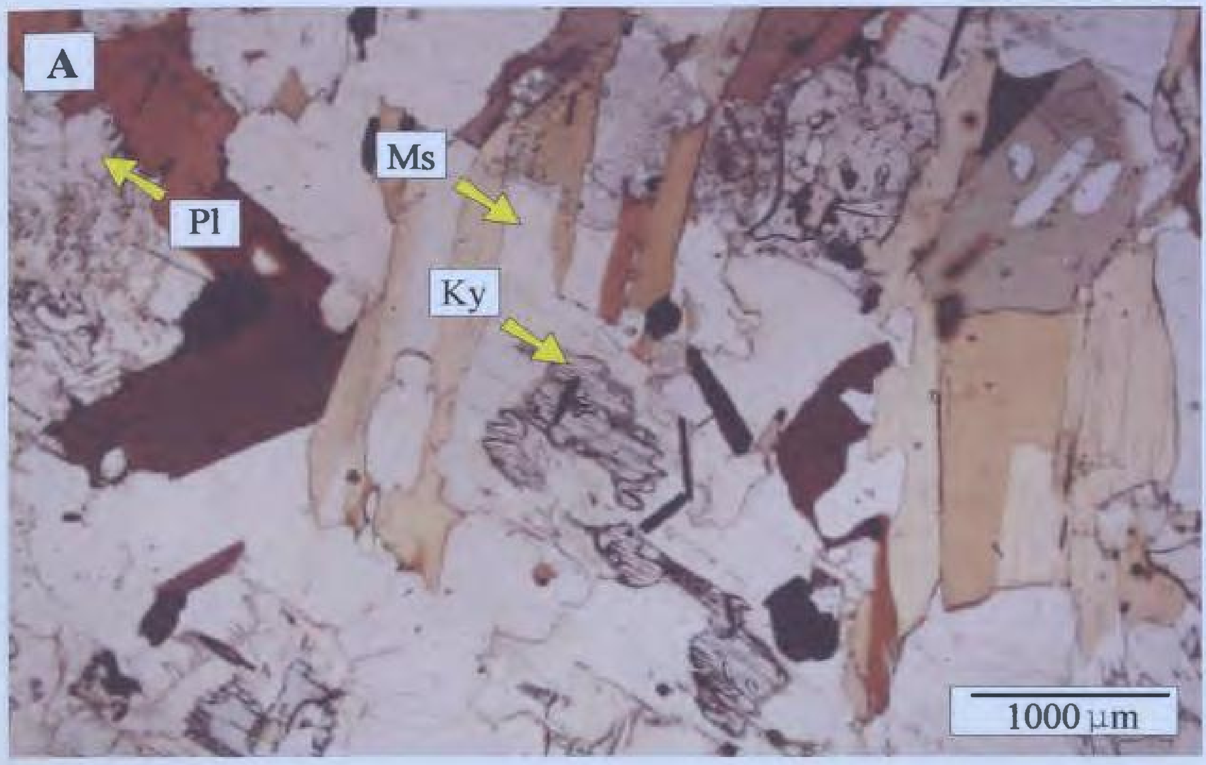


Plate 6.16: Retrograde porphyroblastic muscovite enclosing relict kyanite and plagioclase (sample 208). (A) plane polarized light and (B) cross polarized light.

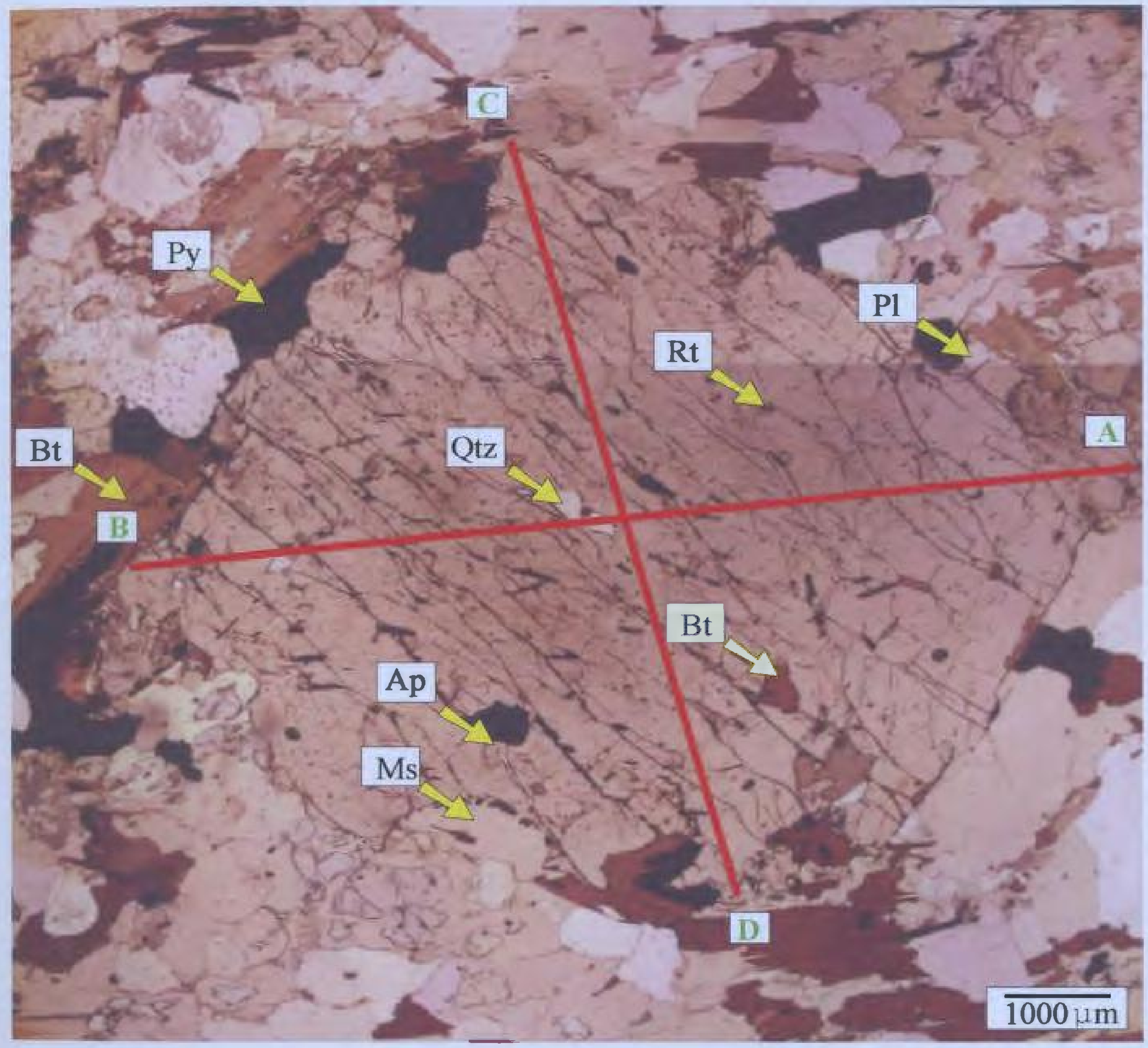
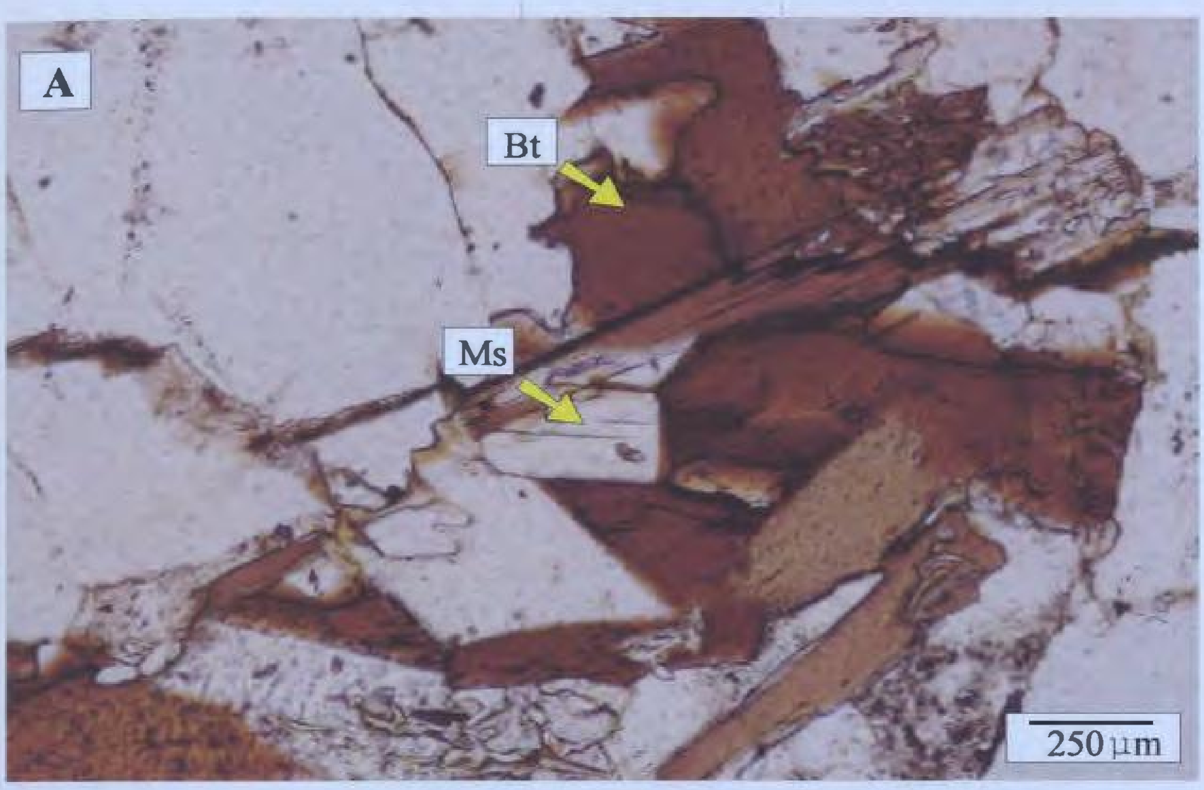


Plate 6.17: Garnet porphyroblast from sample 208 with inclusions of quartz, biotite, apatite, and rutile. Lines A-B and C-D indicate paths of microprobe analyses (see Figures 6.9 and 6.10).



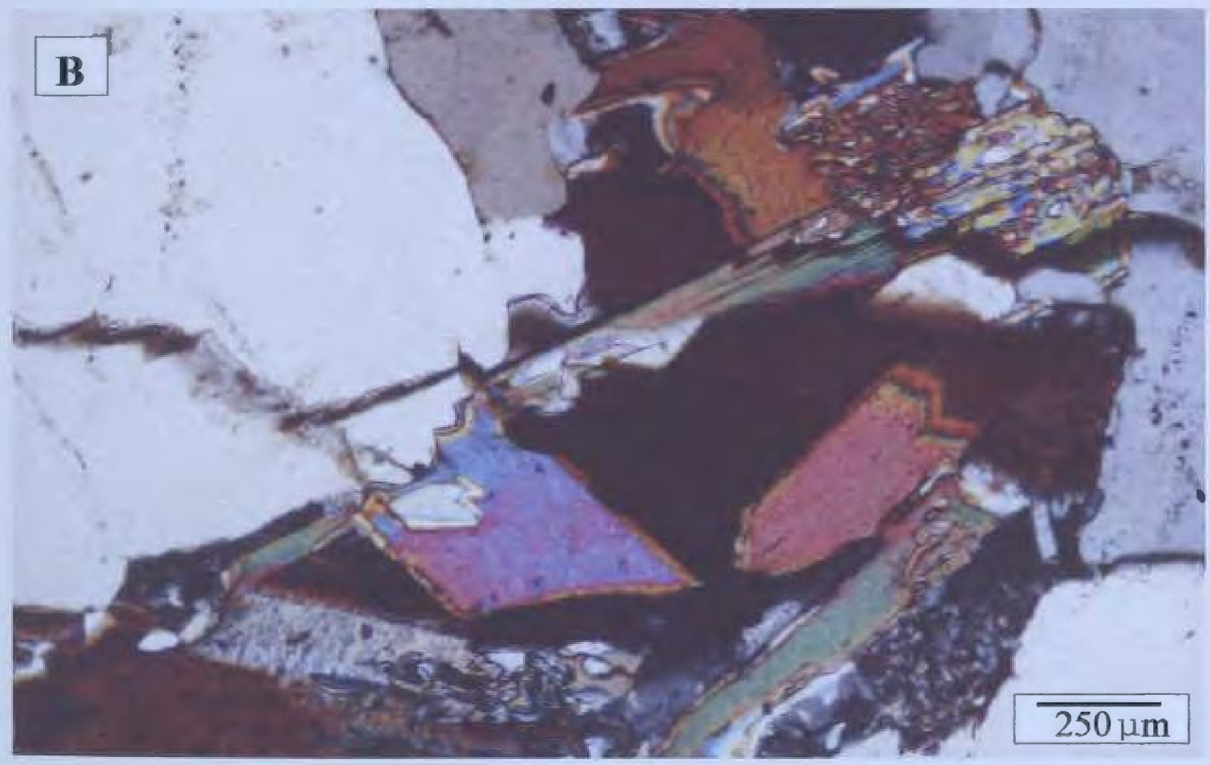


Plate 6.18: Retrograde biotite + quartz + muscovite intergrowths (sample 208). (A) plane polarized light and (B) cross polarized light.

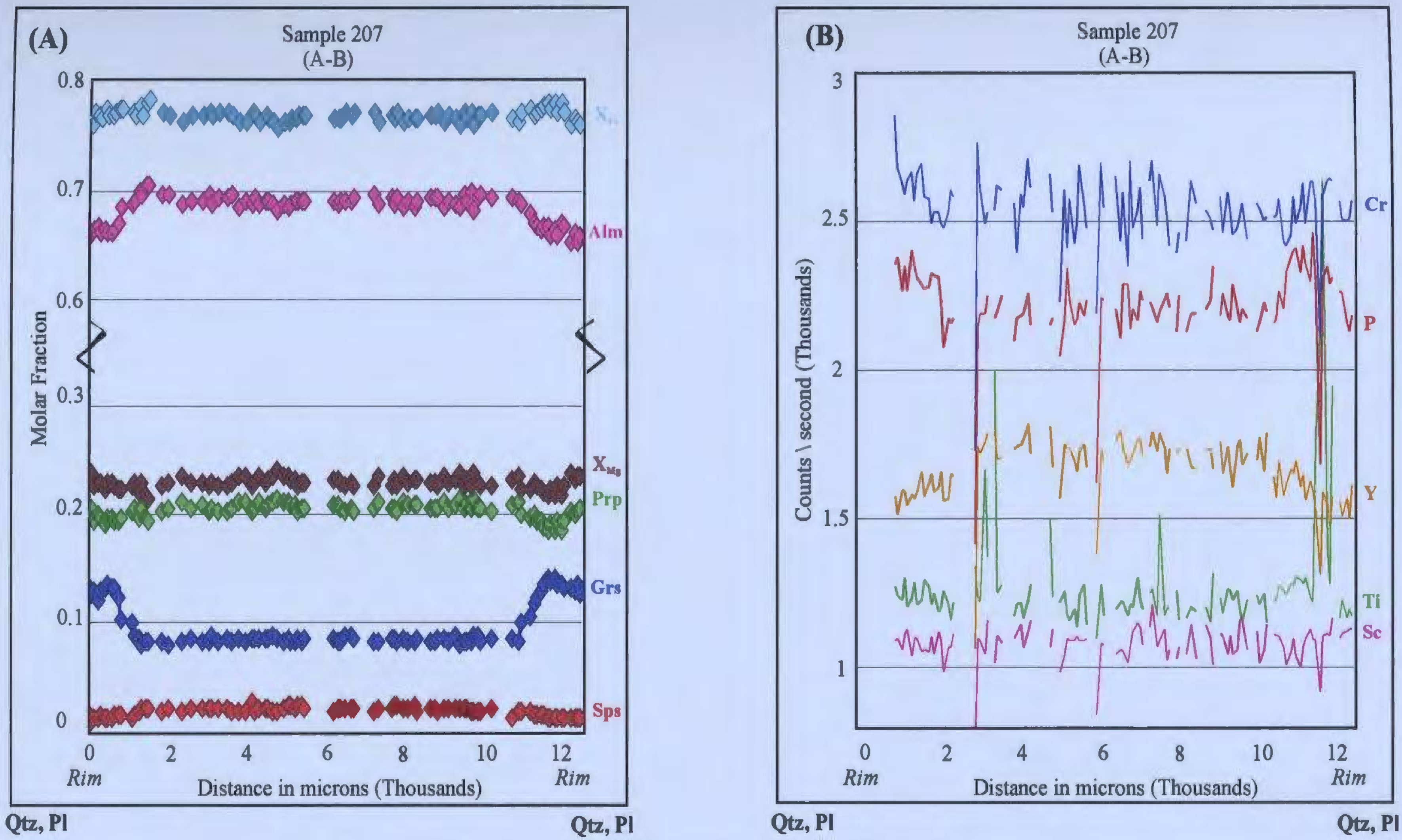


Figure 6.1: Zoning profiles of a garnet from sample 207 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 6.4 for location of transect. Both rims are in contact with Pl and Qtz.

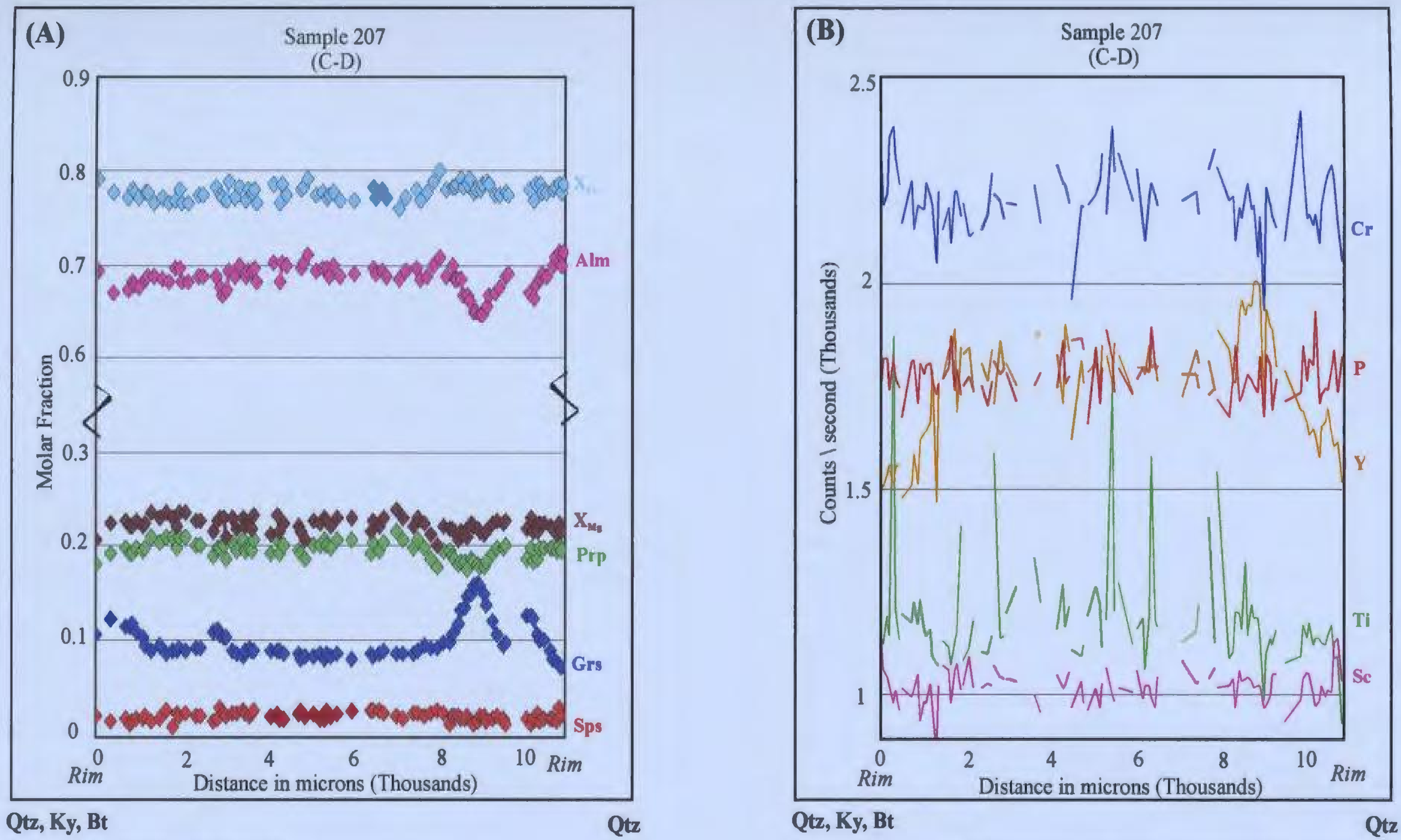


Figure 6.2: Zoning profiles of a garnet from sample 207 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect C-D. See Plate 6.4 for location of transect. Rim C is in direct contact with Qtz, Ky and Bt; rim D is separated from the Bt + Ky fabric, which wraps around the rim, by Qtz.

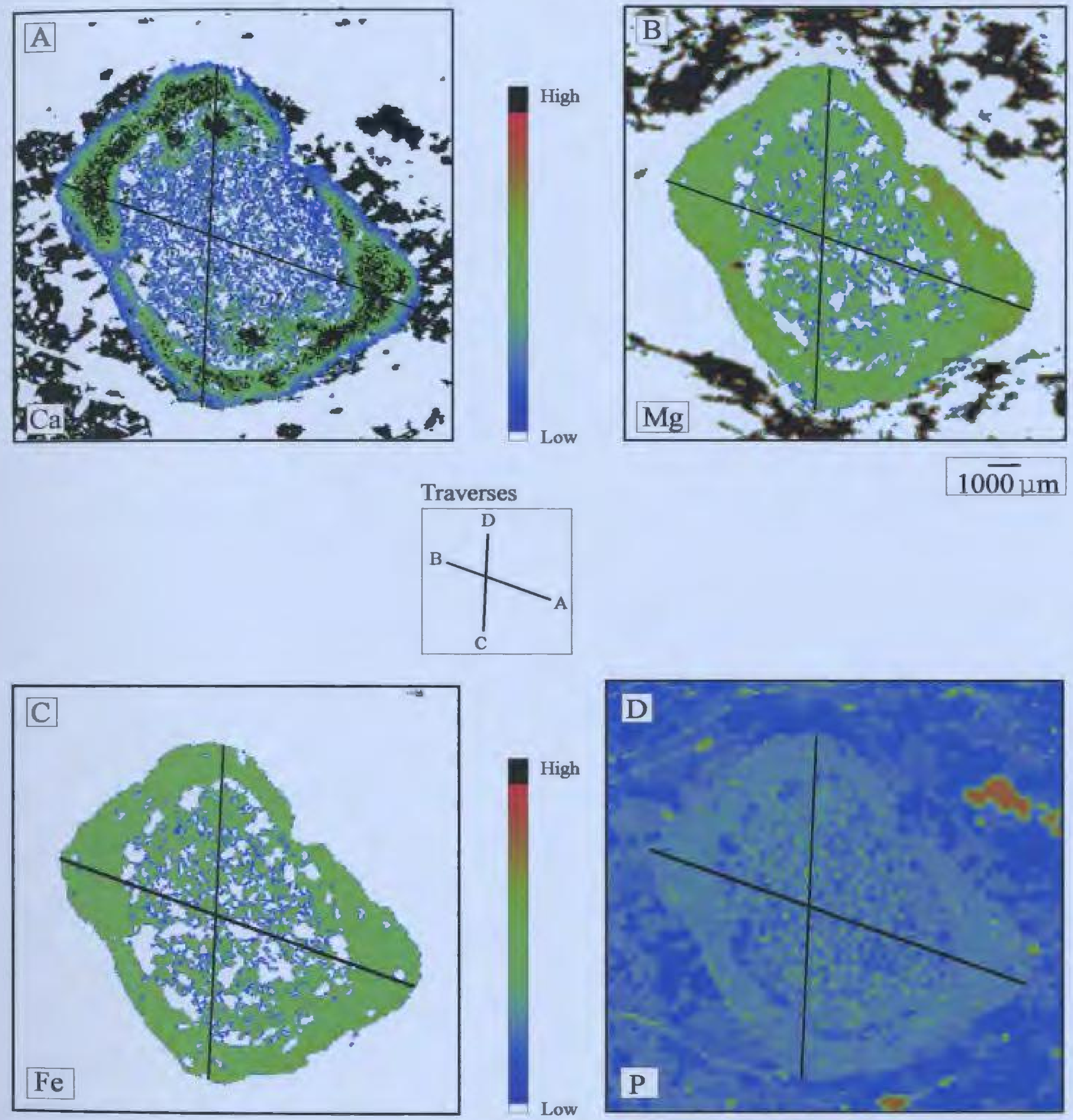


Figure 6.3: X-ray compositional maps of the garnet porphyroblast from sample 207 in terms of (A) Ca, (B) Mg, (C) Fe, and (D) P. The color scale indicates relative abundance of the element.

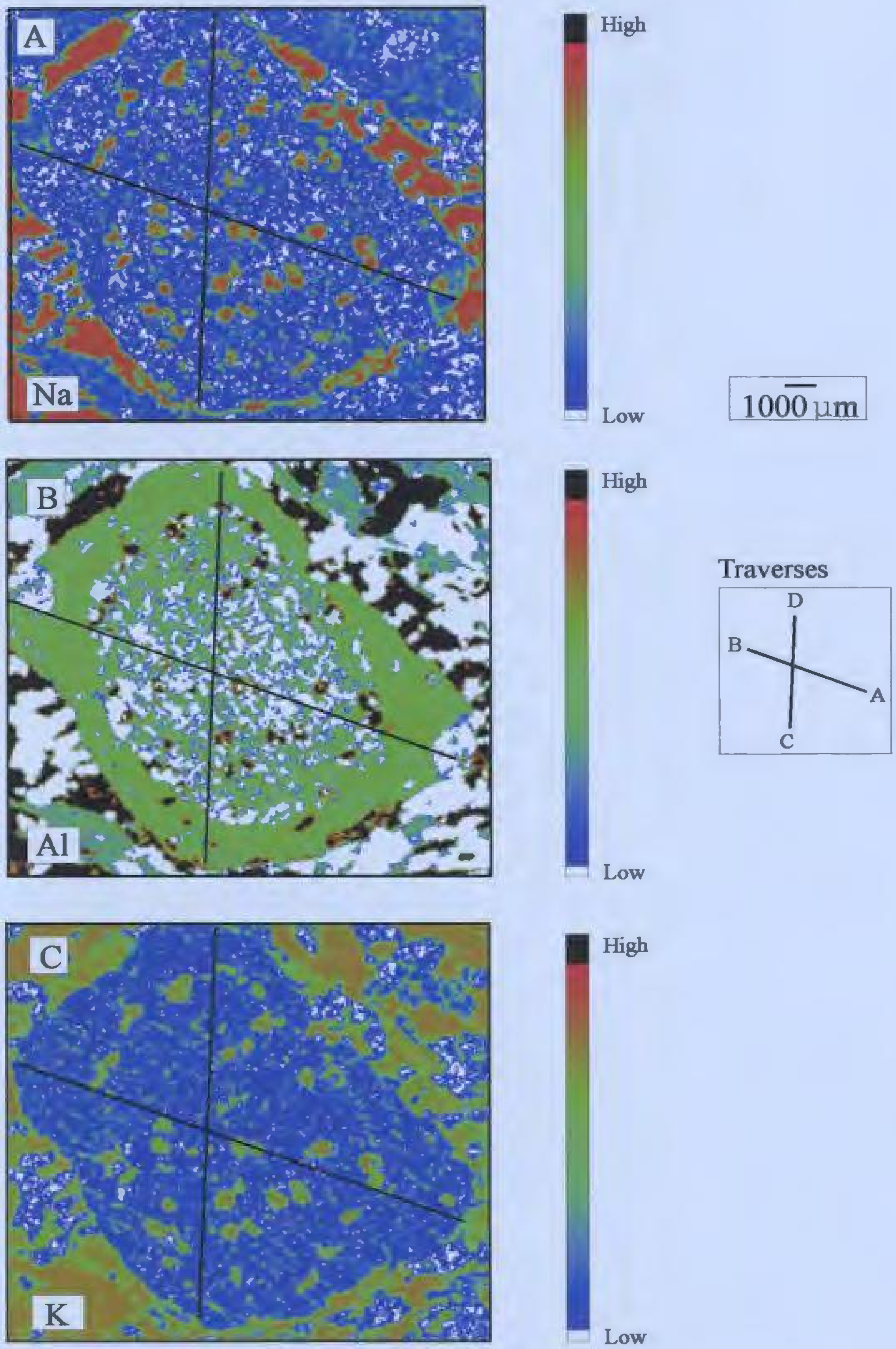


Figure 6.4: X-ray compositional maps of a garnet porphyroblast from sample 207 in terms of (A) Na, (B) Al and (C) K. The color scale indicates relative abundance of the element. The areas of high K and Na content throughout the core of the garnet show the distribution of trapped melt inclusions.

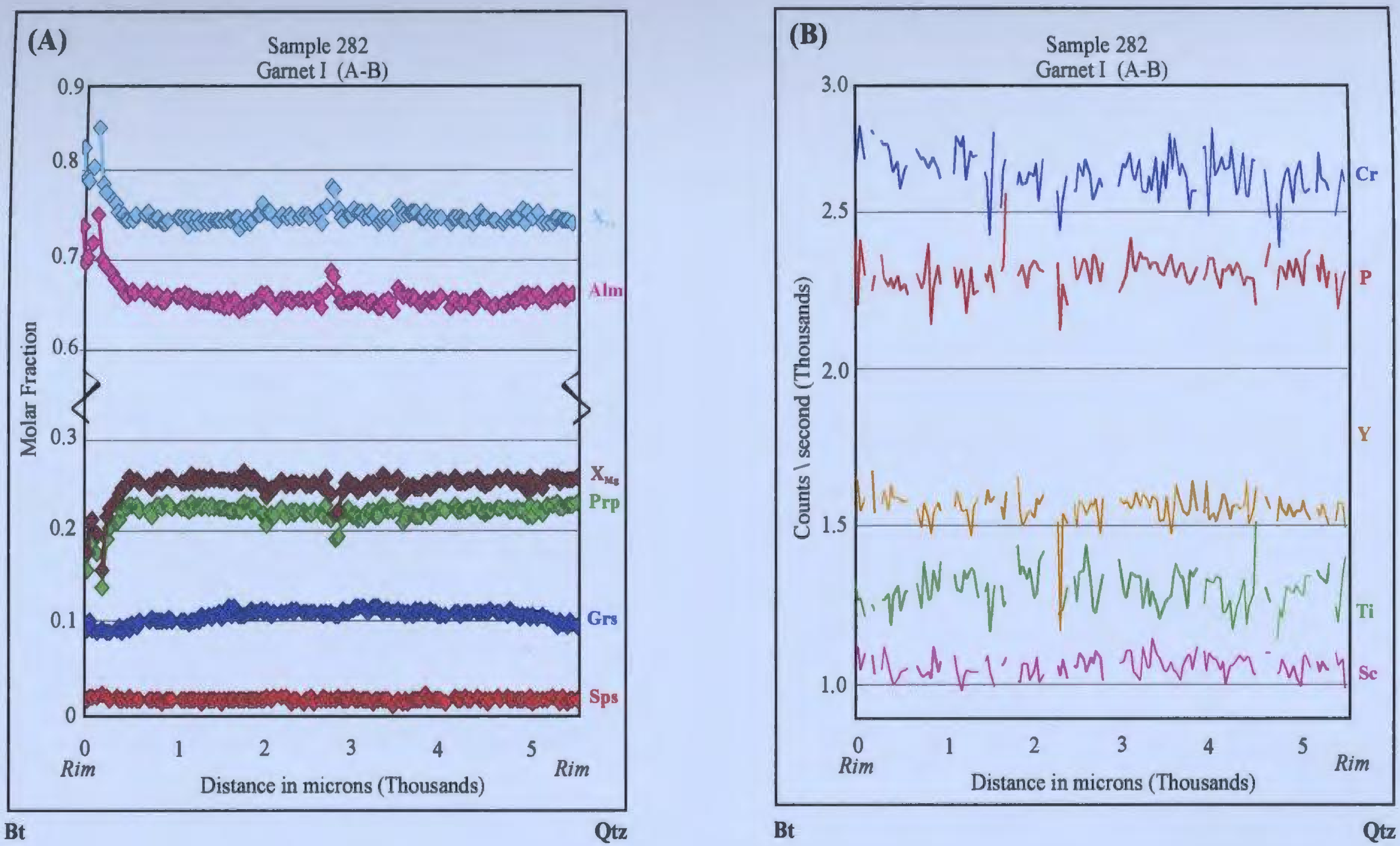


Figure 6.5: Zoning profiles of Garnet I from sample 282 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 6.8 for location of transect. Rim A is in contact with Bt; rim A is in contact with Qtz.

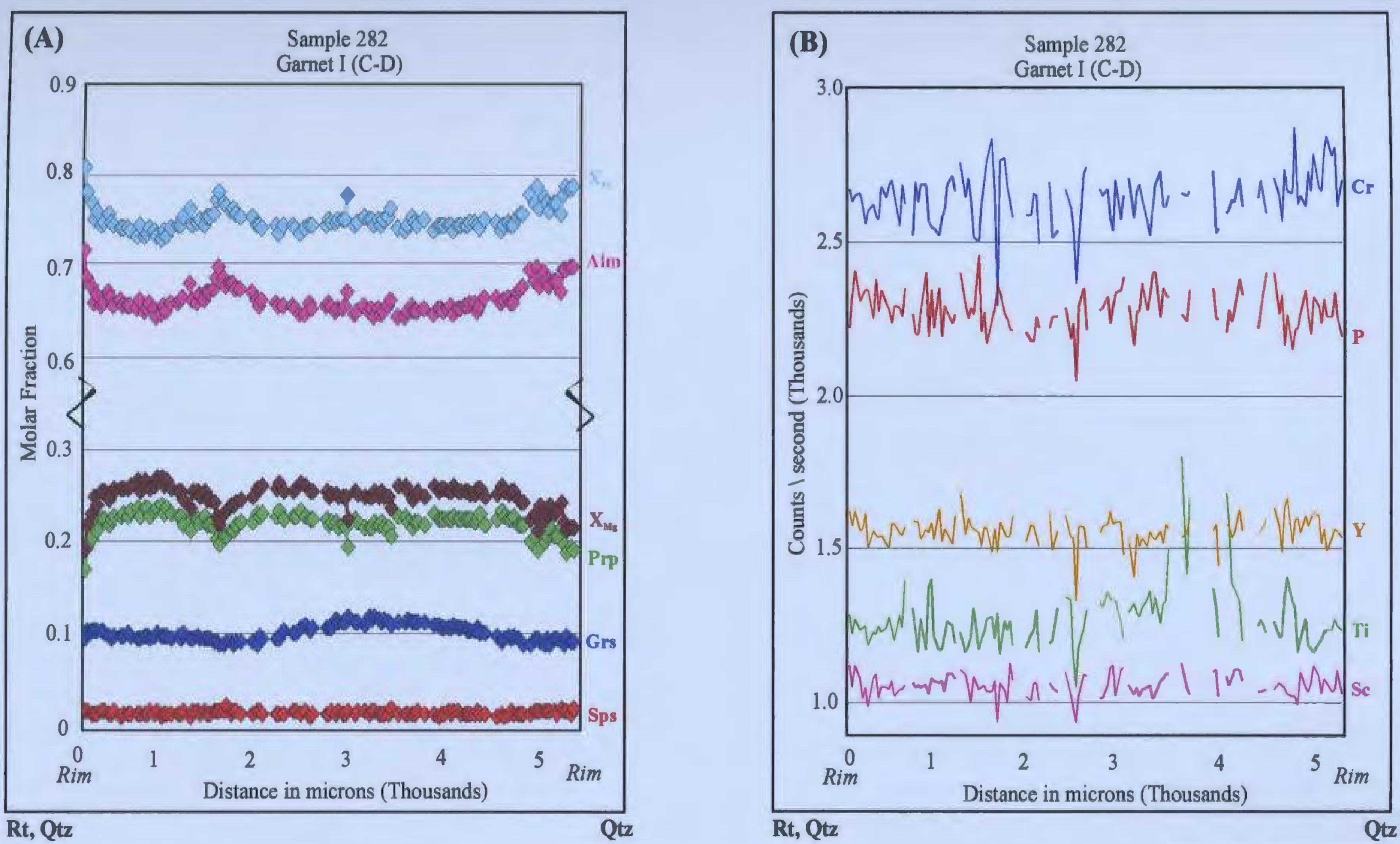


Figure 6.6: Zoning profiles of Garnet I from sample 282 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect C-D. See Plate 6.8 for location of transect. Rim C is in contact Rt and Qtz; rim D is in contact with Qtz.

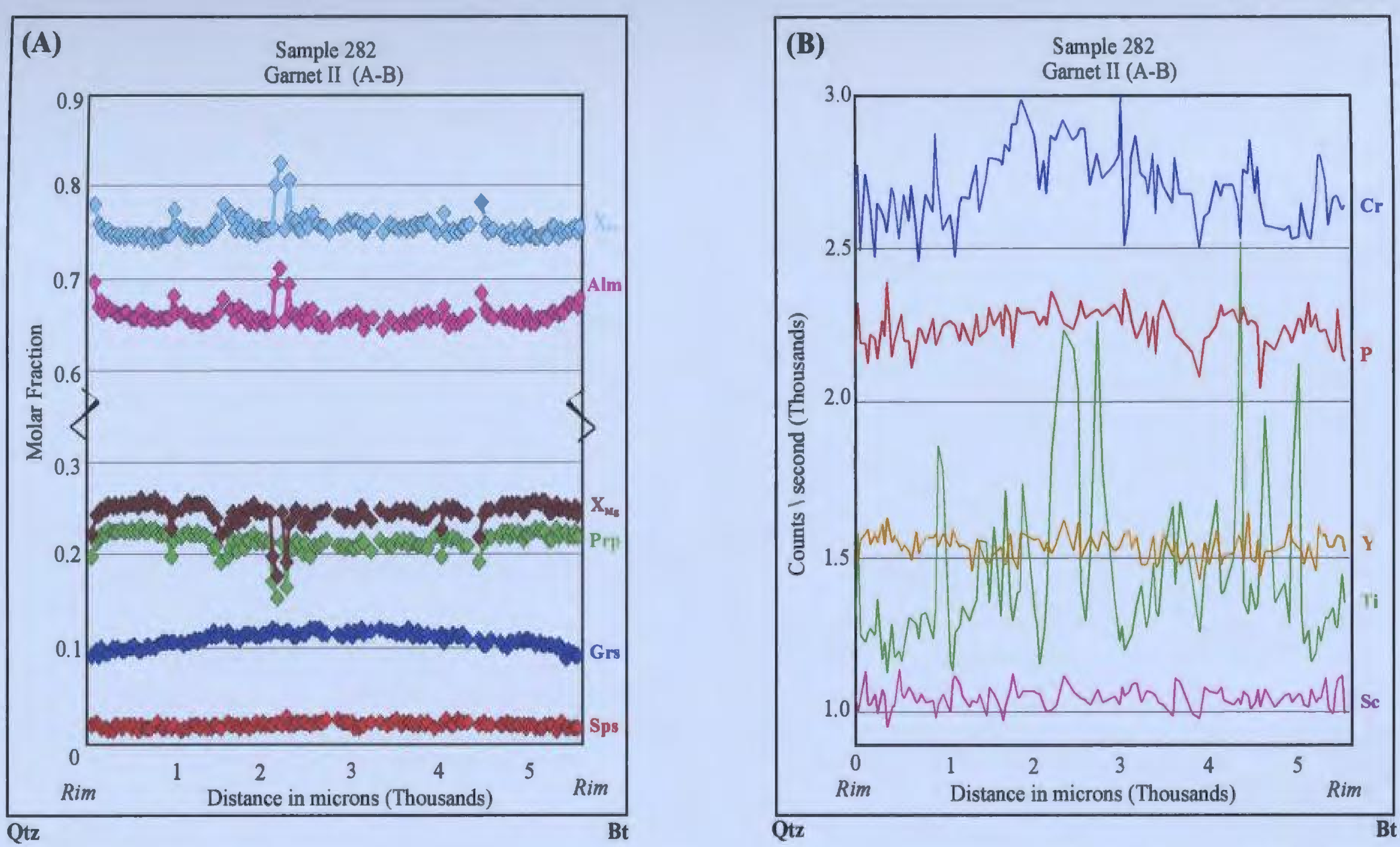


Figure 6.7: Zoning profiles of Garnet II from sample 282 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 6.9 for location of transect. Rim A is in contact with Qtz; rim B is in contact with Bt.

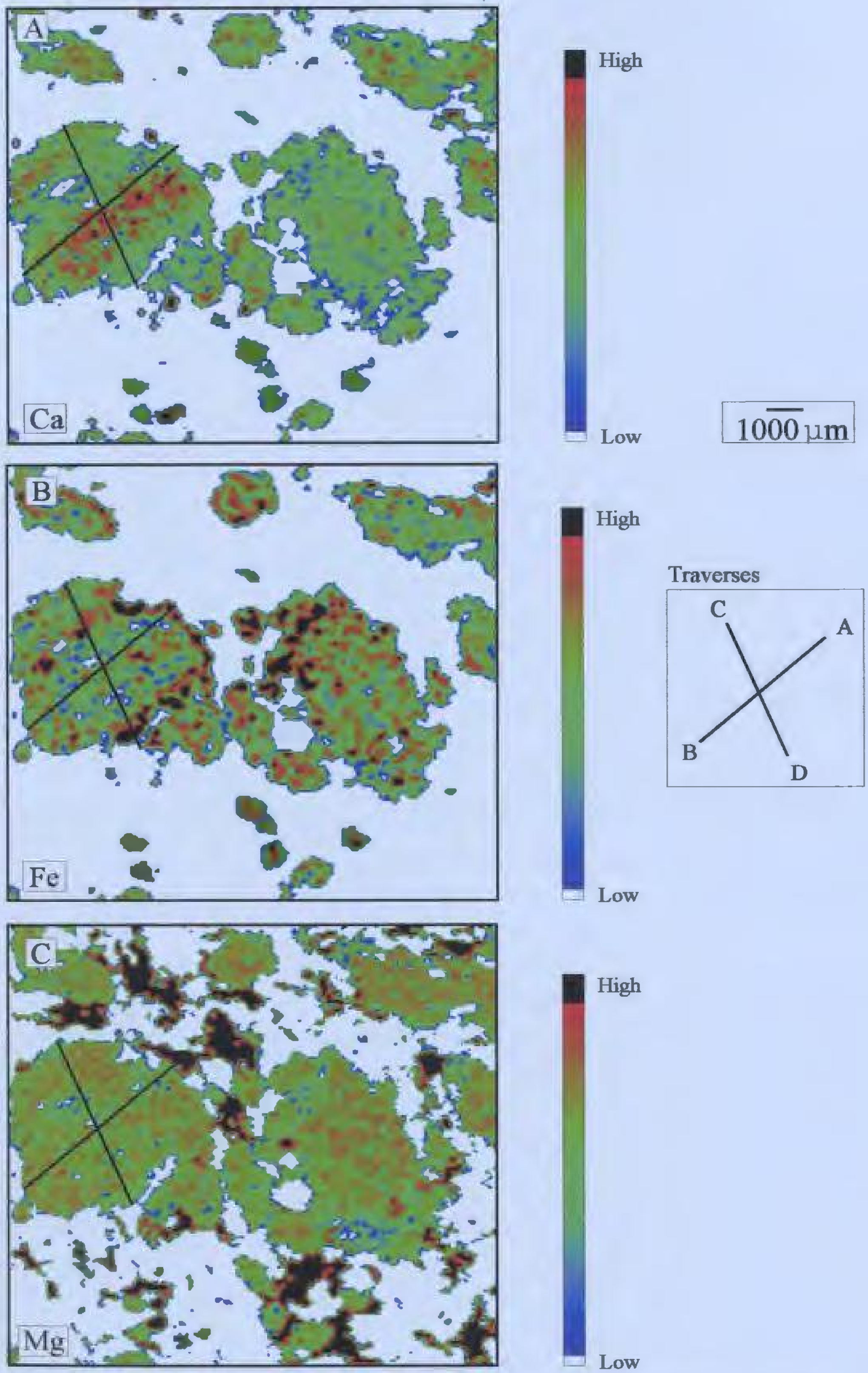


Figure 6.8: X-ray compositional maps of garnet porphyroblasts from sample 282 in terms of (A) Ca, (B) Fe and (C) Mg. Garnet I is the porphyroblast on the left, Garnet II is not in the field of view. The color scale indicates relative abundance of the element.

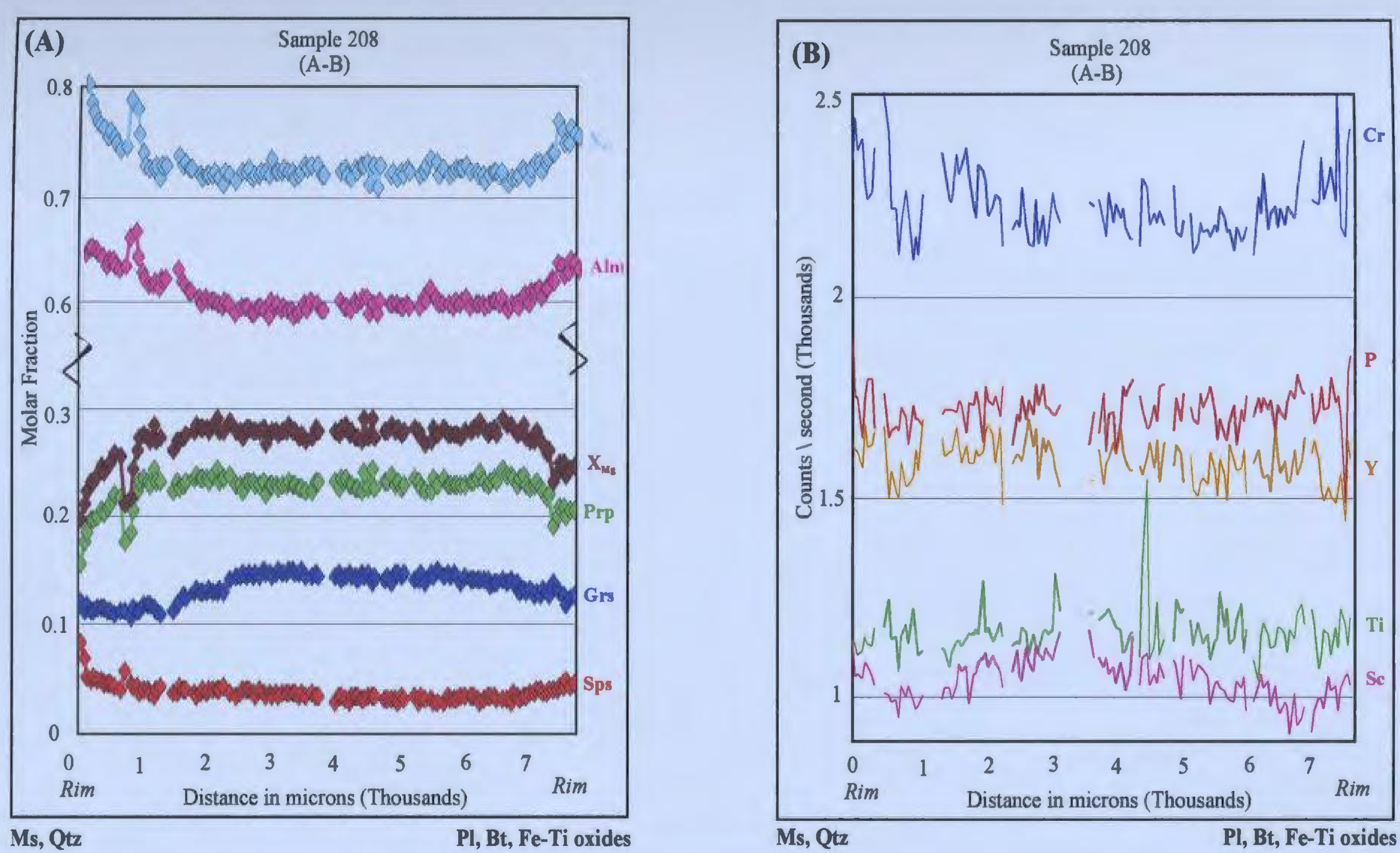


Figure 6.9: Zoning profiles of a garnet from sample 208 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 6.17 for location of transect. Rim A is in contact with Ms and Qtz; rim B is in contact with Pl, Bt, and Fe-Ti oxides.

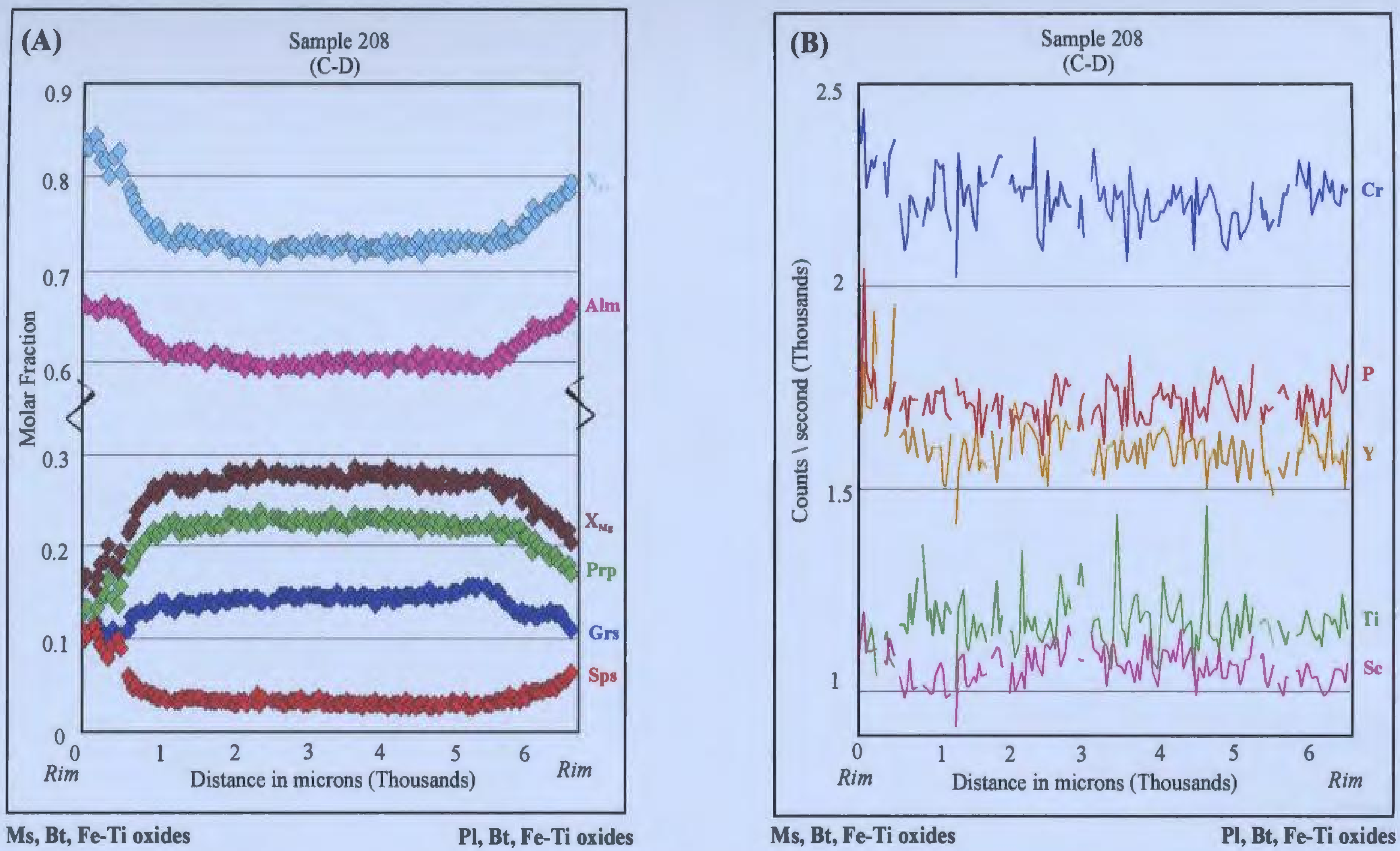
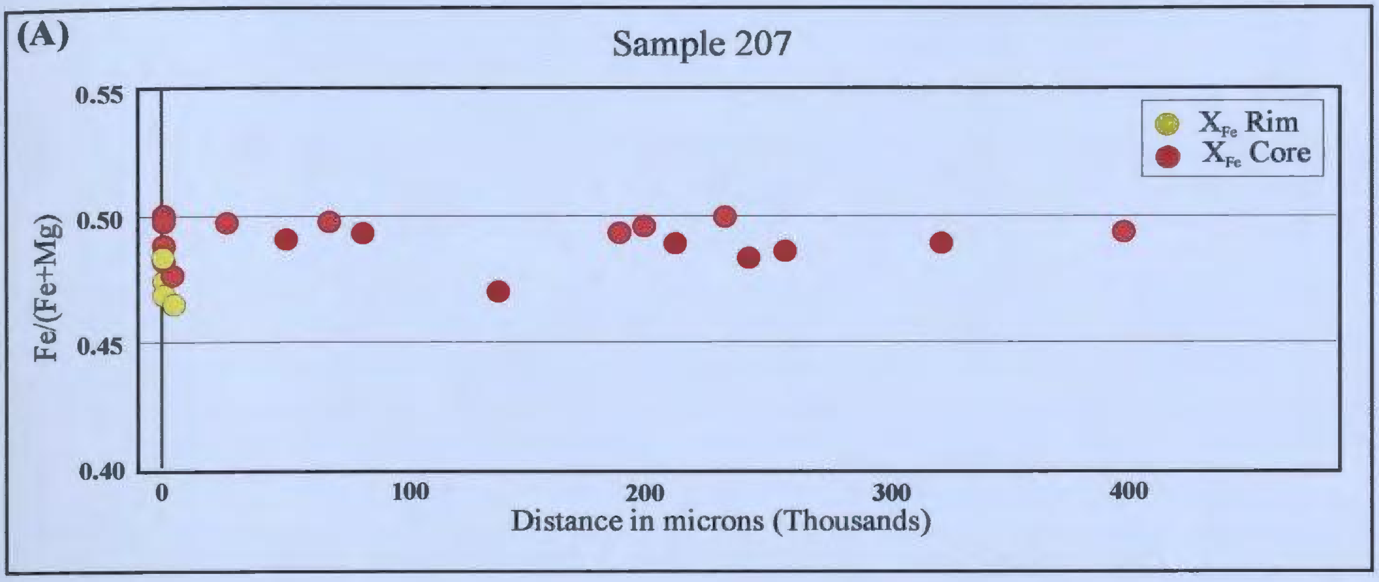


Figure 6.10: Zoning profiles of a garnet from sample 208 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect C-D. See Plate 6.17 for location of transect. Rim A is in contact with Ms, Bt, Fe-Ti oxides; rim B is in contact with Pl, Bt, Fe-Ti oxides.



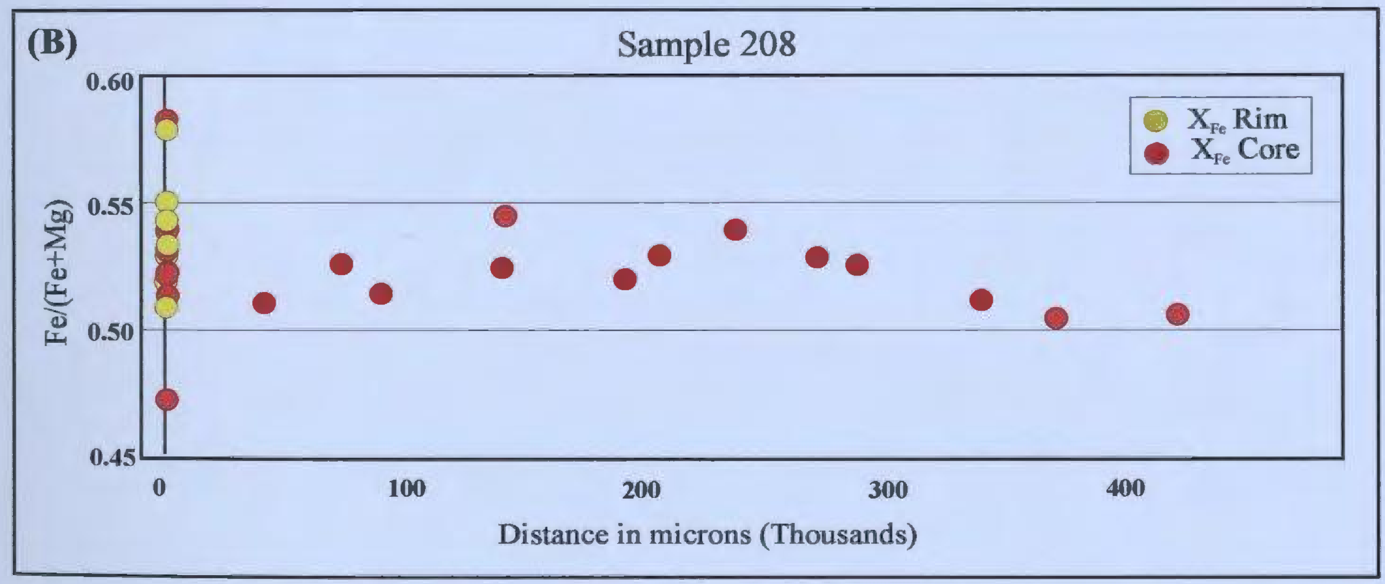
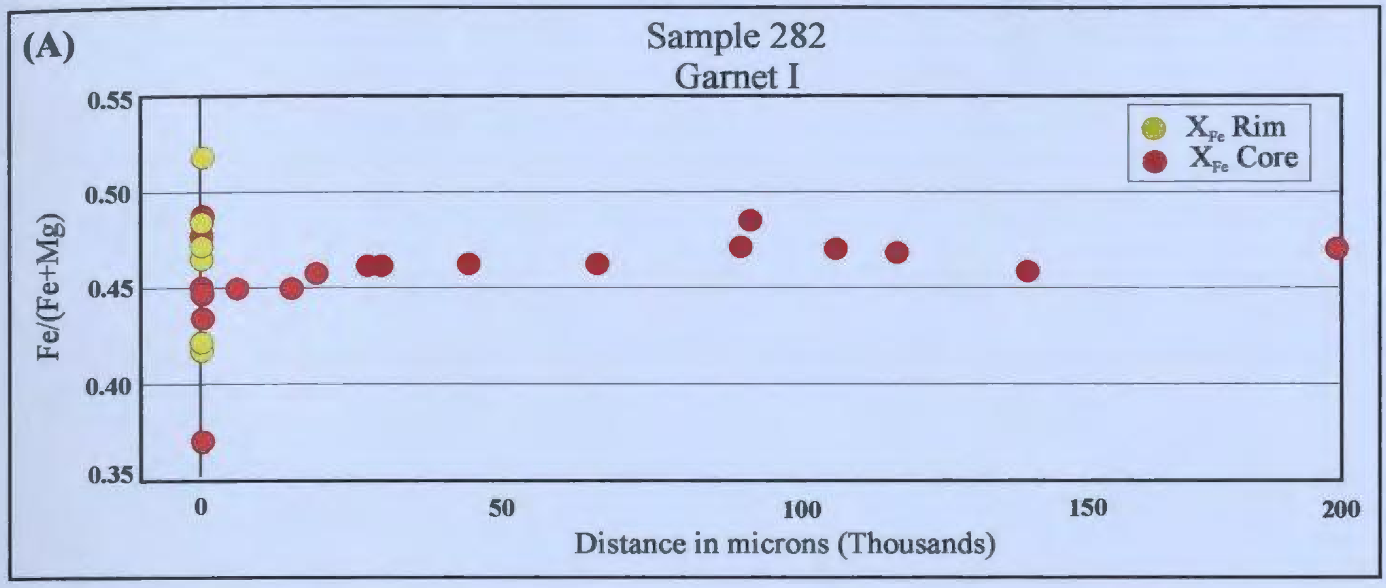


Figure 6.11: X_{Fe} biotite versus distance from the garnet porphyroblast in (A) sample 207 and (B) sample 208.



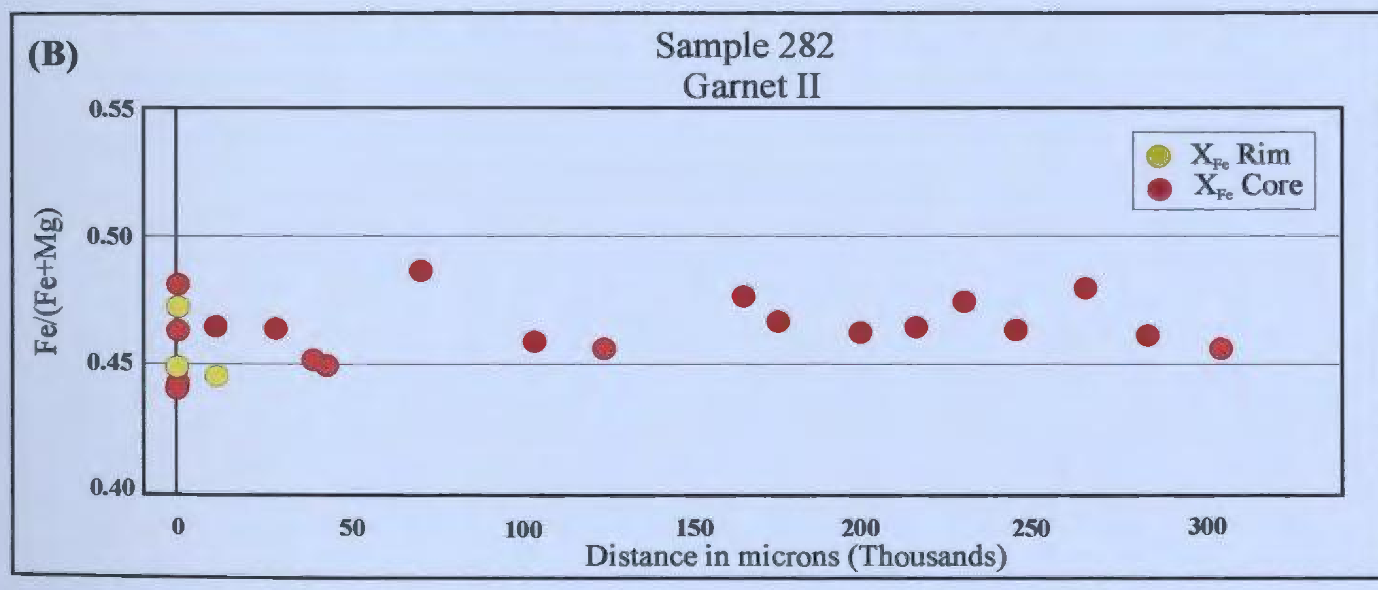


Figure 6.12: X_{Fe} biotite versus distance from (A) Garnet I and (B) Garnet II from sample 282.

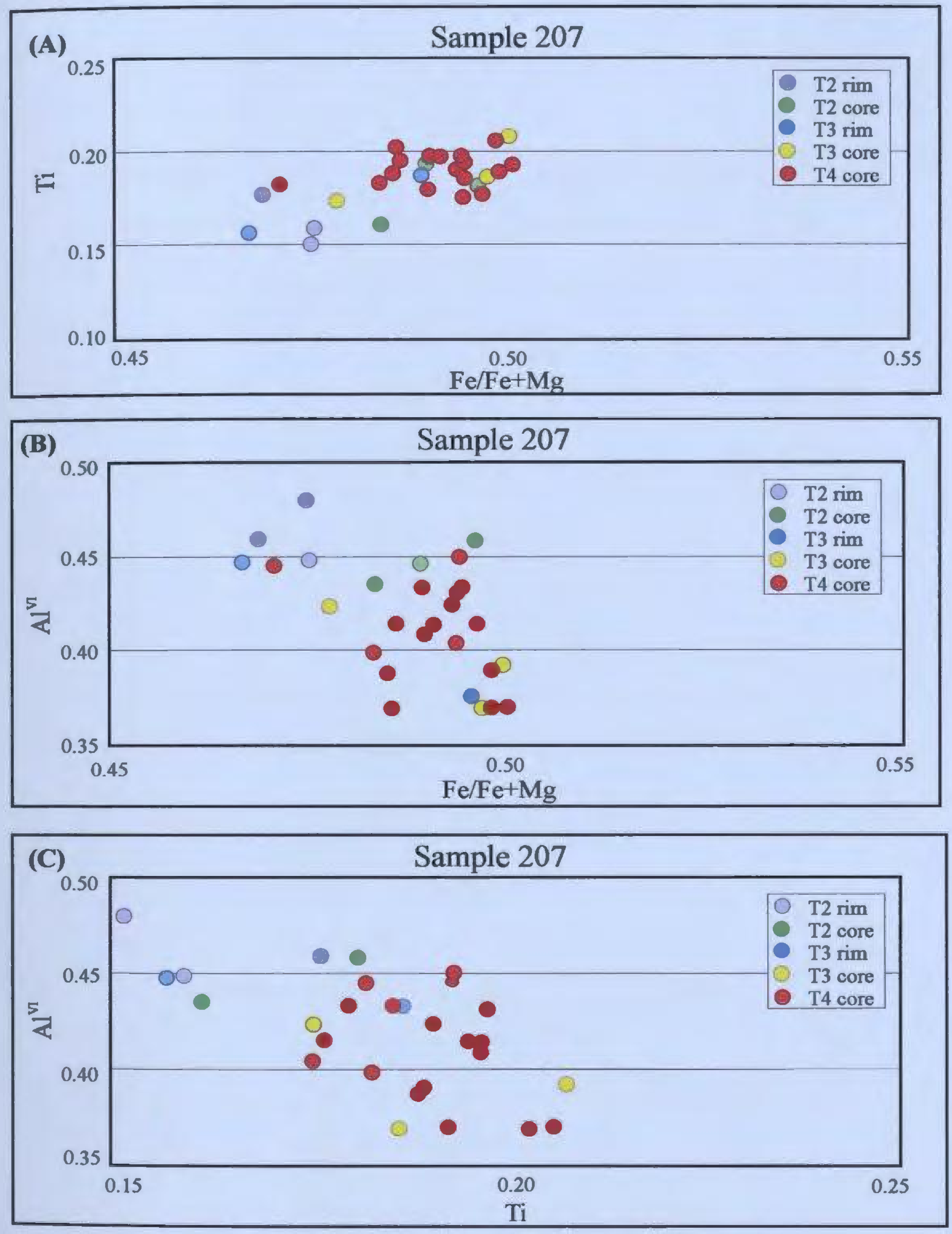


Figure 6.13:(A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from sample 207.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from sample 207.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite from sample 207.
T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

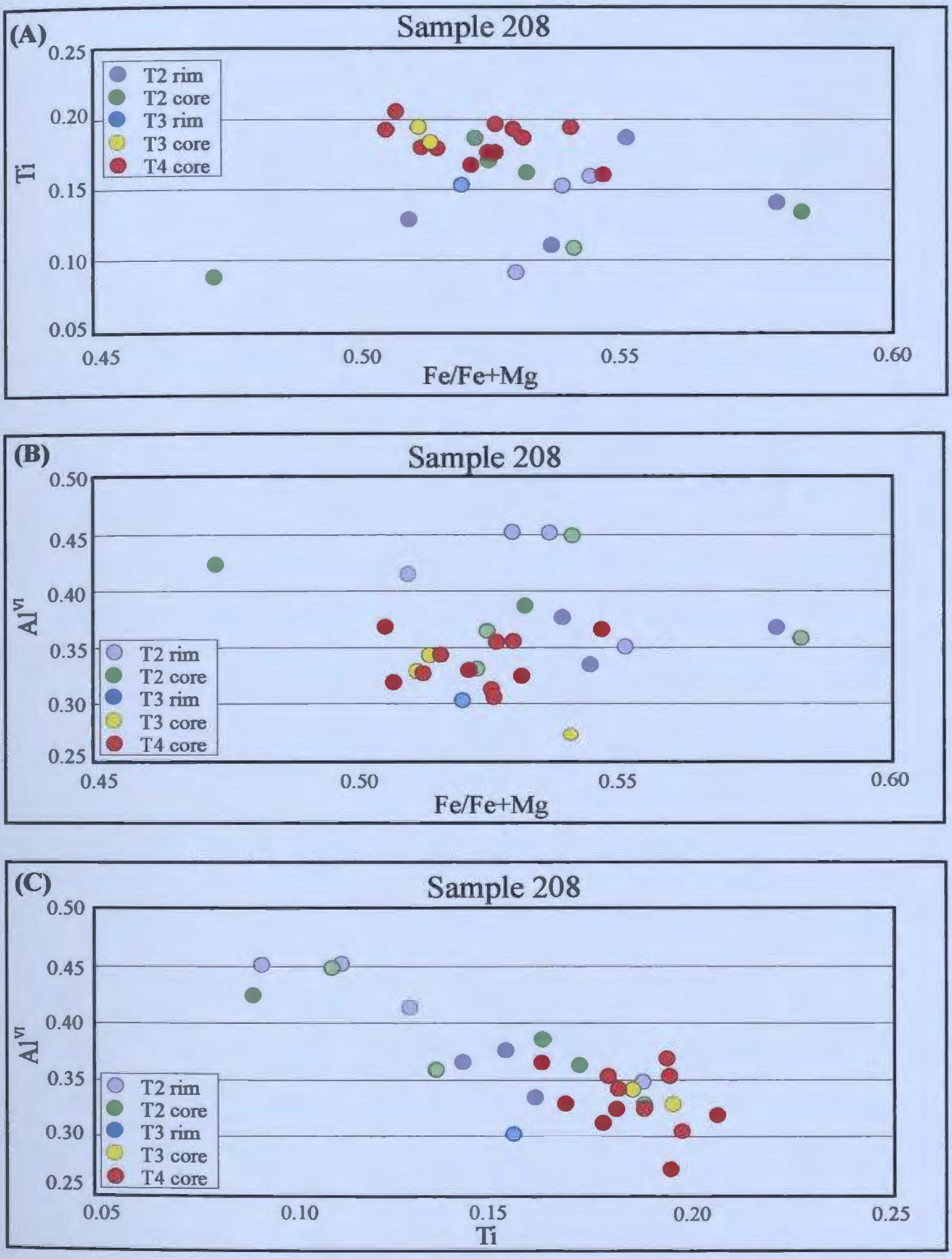


Figure 6.14:(A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from sample 208.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite from sample 208.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite from sample 208.
T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

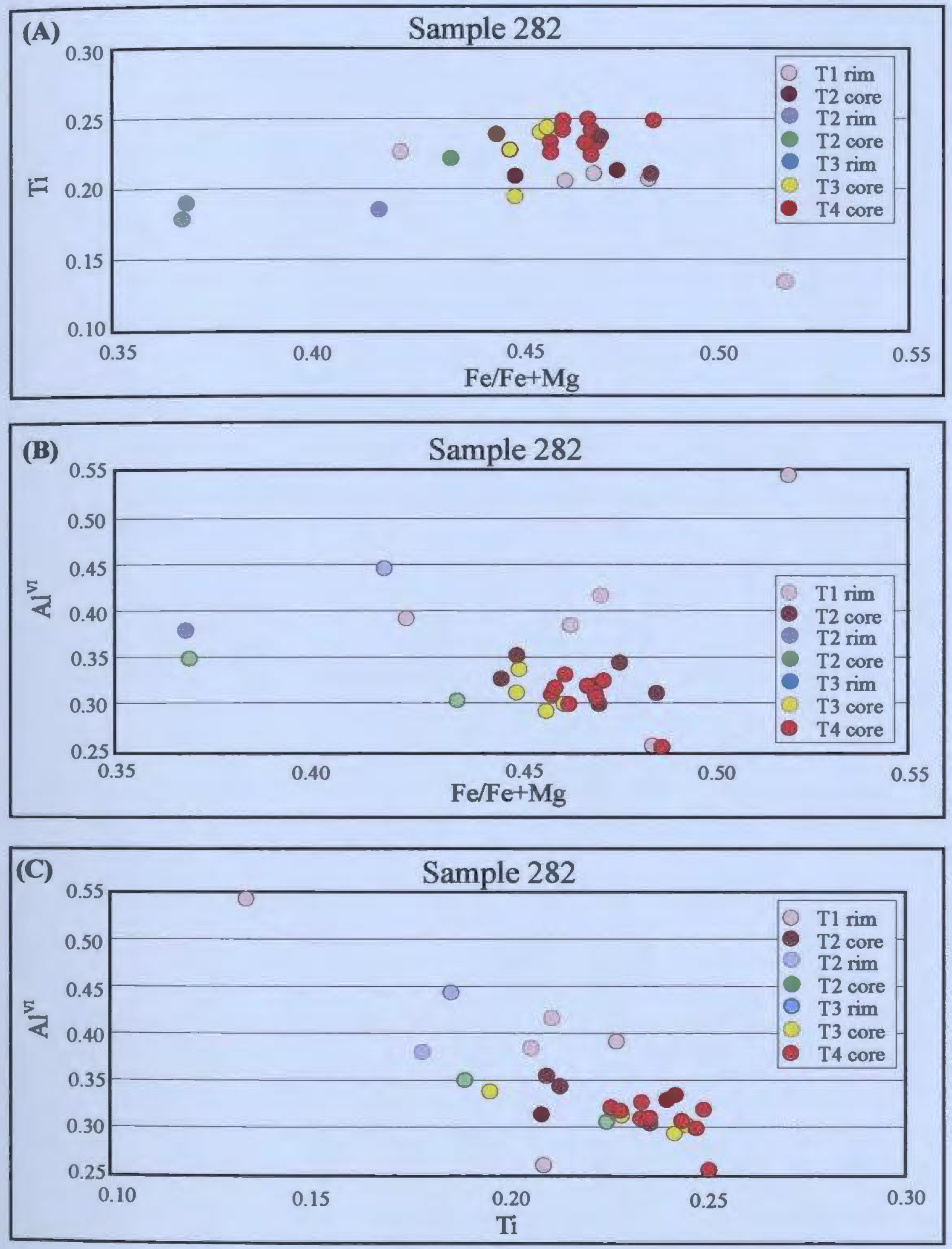


Figure 6.15: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet I.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet I.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite associated with Garnet I.
T1=biotite included in garnet, T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

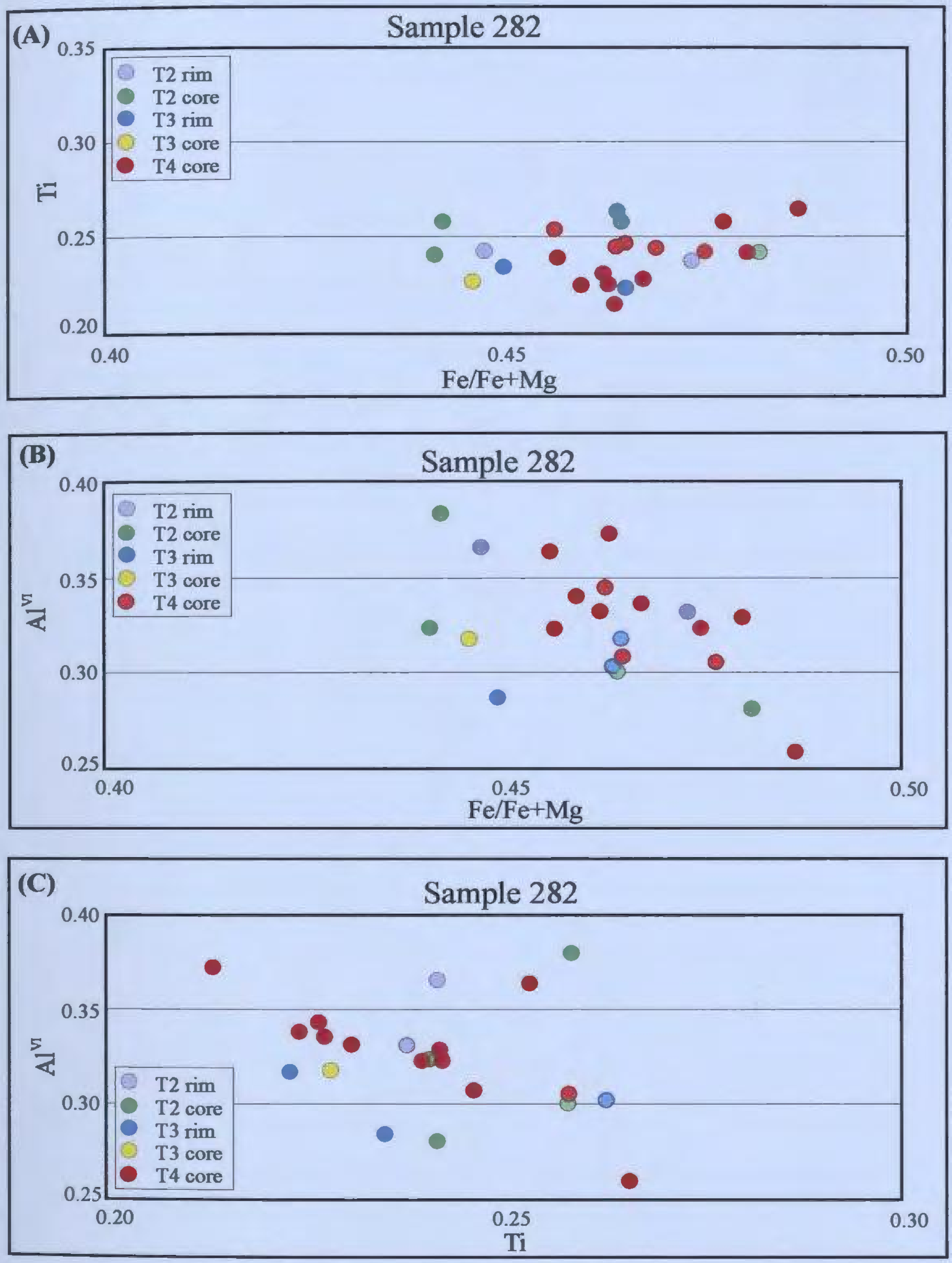


Figure 6.16: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet II.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet II.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite associated with Garnet II.
T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

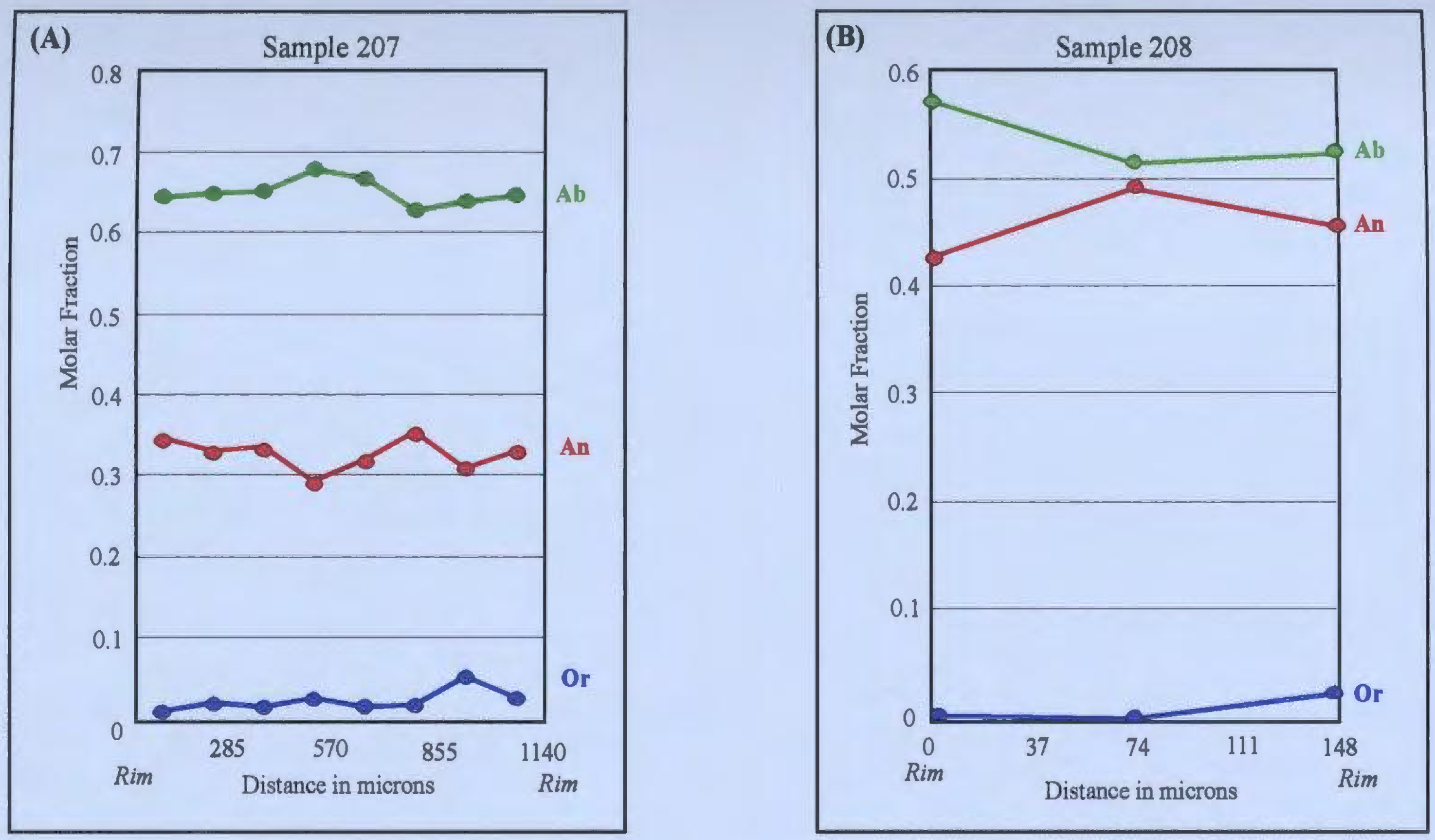


Figure 6.17: Zoning profiles of a plagioclase grain touching garnet (T2) from (A) sample 207 and (B) sample 208 in terms of molar fractions of Ab, An, and Or.

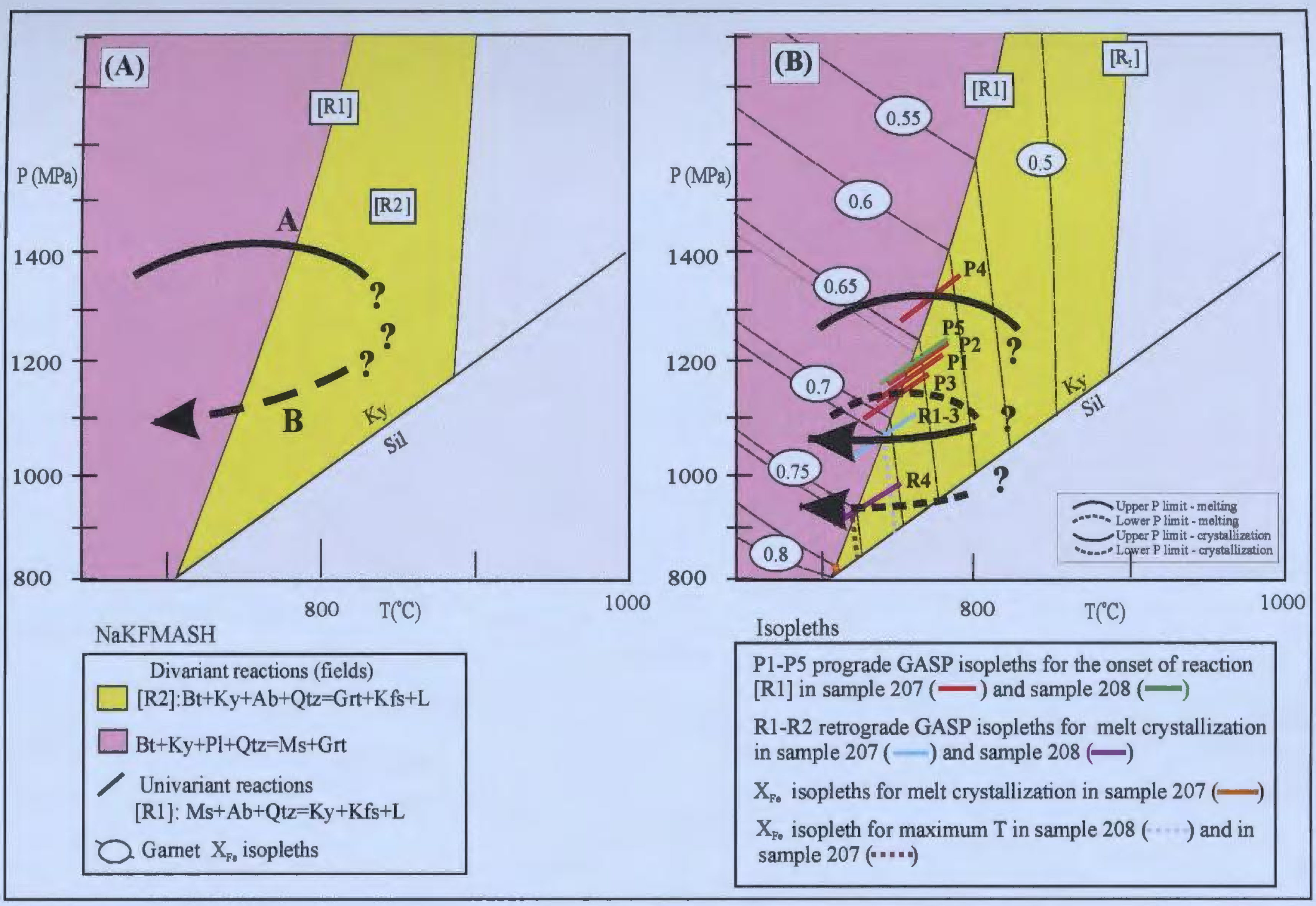


Figure 6.18: *P-T* diagram showing the locations of selected melting reactions in the kyanite field (NaKFMASH system) (modified after Spear et al. 1999); and the proposed *P-T* path for samples from thrust slice #3. (A) qualitative *P-T* path deduced from textural interpretations (B) *P-T* paths constrained by GASP isopleths. Also shown are selected garnet X$_{Fe}$ isopleths.

Table 6.1: Representative garnet analyses from thrust slice #3. See Tables 3.9a - 3.15a - Appendix 3 for complete data set.

			Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
	#	Type	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
207	1	rim	32.24	4.73	3.81	0.89	21.27	38.37	0.07	101.3	2.11	0.55	0.32	0.06	1.96	3.01	0.00	8.01	0.69	0.18	0.10	0.02	0.79	0.21
	75	core	31.24	5.15	3.06	1.14	21.53	39.10	0.00	101.2	2.03	0.60	0.25	0.07	1.97	3.04	0.00	7.97	0.69	0.20	0.09	0.03	0.77	0.23
	123	Ca peak	30.60	4.81	5.89	0.59	21.58	38.91	0.03	102.3	1.97	0.55	0.49	0.04	1.96	3.00	0.00	8.02	0.65	0.18	0.16	0.01	0.78	0.22
208	1	rim	29.87	4.07	4.33	3.69	20.93	36.65	0.00	99.54	2.01	0.49	0.37	0.25	1.99	2.95	0.00	8.06	0.64	0.16	0.12	0.08	0.80	0.20
	79	core	28.22	6.13	5.22	1.19	21.54	37.82	0.05	100.1	1.85	0.72	0.44	0.08	1.99	2.97	0.00	8.04	0.59	0.23	0.15	0.03	0.72	0.28
282	79	core	30.62	5.50	4.11	0.89	21.34	38.19	0.05	100.6	2.01	0.64	0.35	0.06	1.97	2.99	0.00	8.02	0.66	0.21	0.11	0.02	0.76	0.24
	150	rim	31.86	6.00	3.41	0.67	22.02	38.42	0.01	102.3	2.06	0.69	0.28	0.04	2.00	2.96	0.00	8.04	0.67	0.22	0.09	0.01	0.75	0.25

Table 6.2: Representative biotite analyses from thrust slice #3. T1 = biotite included in garnet, T2 = biotite in contact with garnet, T3 = biotite adjacent to garnet and T4 = biotite isolated from garnet in the matrix. See Tables 4.4, 4.5 and 4.6 - Appendix 4 for complete data set.

			Oxide percentage								Cations on a 11(O) basis											Proportion in the oct. site			
	#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{VI}	Al^{IV}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
282	3r	1	6.07	34.12	21.18	18.24	9.49	0.14	2.32	91.87	0.60	2.63	1.37	0.55	1.17	1.09	0.01	0.13	7.58	0.52	0.48	0.40	0.37	0.19	0.05
	3c	1	9.25	35.27	19.07	16.12	11.00	0.04	3.70	94.71	0.89	2.66	1.34	0.35	1.02	1.24	0.00	0.21	7.75	0.45	0.55	0.36	0.44	0.13	0.07
	6r	1	9.18	35.43	19.10	16.20	10.49	0.08	3.62	94.27	0.89	2.68	1.32	0.38	1.03	1.18	0.01	0.21	7.72	0.46	0.54	0.37	0.42	0.14	0.07
	6c	1	9.42	35.45	17.96	17.57	10.42	0.00	3.66	94.48	0.92	2.70	1.30	0.31	1.12	1.18	0.00	0.21	7.74	0.49	0.51	0.40	0.42	0.11	0.07
208	8r	2	9.65	36.32	18.06	19.72	9.05	0.03	3.30	96.11	0.93	2.74	1.26	0.35	1.25	1.02	0.00	0.19	7.73	0.55	0.45	0.44	0.36	0.12	0.07
	8c	2	9.54	36.77	18.09	19.31	9.92	0.04	3.35	96.98	0.91	2.74	1.26	0.33	1.20	1.10	0.00	0.19	7.73	0.52	0.48	0.43	0.39	0.12	0.07
	9c	3	9.68	36.75	18.01	18.67	10.02	0.12	3.48	96.61	0.92	2.74	1.26	0.33	1.17	1.12	0.01	0.20	7.73	0.51	0.49	0.42	0.40	0.12	0.07
	10c	4	9.98	37.27	18.40	19.94	10.10	0.03	3.59	99.29	0.93	2.72	1.28	0.31	1.22	1.10	0.00	0.20	7.75	0.53	0.47	0.43	0.39	0.11	0.07
207	2r	2	9.76	36.95	19.56	15.99	10.17	0.26	3.16	95.58	0.93	2.75	1.25	0.46	0.99	1.13	0.02	0.18	7.68	0.47	0.53	0.36	0.41	0.17	0.06
	2c	2	10.10	38.46	19.66	16.96	9.93	0.00	3.56	98.67	0.93	2.77	1.23	0.45	1.02	1.07	0.00	0.19	7.66	0.49	0.51	0.37	0.39	0.16	0.07
	6c	3	10.01	36.78	19.02	17.36	9.75	0.21	3.73	96.64	0.95	2.73	1.27	0.39	1.08	1.08	0.01	0.21	7.70	0.50	0.50	0.39	0.39	0.14	0.08
	7c	4	10.02	37.52	19.31	18.16	10.27	0.00	3.78	99.06	0.93	2.72	1.28	0.37	1.10	1.11	0.01	0.21	7.71	0.50	0.50	0.40	0.40	0.13	0.07

Table 6.3: Representative plagioclase analyses from thrust slice #3. The T1 and T2 grains are from sample 207 while the T3 and T4 grains are from sample 208. T1 = plagioclase included in garnet, T2 = plagioclase in contact with garnet, T3 = plagioclase adjacent to garnet and T4 = plagioclase isolated from garnet in the matrix. See Tables 5.4 and 5.5 - Appendix 5 for complete data set.

Grain # and Type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 15 T1	1		7.63	7.52	0.32	26.00	59.26	100.73	0.66	0.36	0.02	1.36	2.63	5.03	0.64	0.35	0.02
	2		6.97	4.80	2.36	26.64	58.32	99.66	0.61	0.23	0.14	1.41	2.63	5.04	0.62	0.24	0.14
	3		8.87	1.11	0.42	30.49	56.54	98.41	0.77	0.05	0.02	1.62	2.54	5.05	0.91	0.06	0.03
	4		11.41	1.27	0.00	20.65	67.10	100.43	0.97	0.06	0.00	1.06	2.93	5.02	0.94	0.06	0.00
	5		9.48	2.20	1.41	22.93	63.47	99.49	0.82	0.11	0.08	1.20	2.82	5.03	0.82	0.10	0.08
	15		0.00	0.00	16.74	19.99	63.81	98.54	0.00	0.00	1.01	1.00	3.00	5.00	0.00	0.00	1.00
	16		0.00	0.00	16.97	18.35	64.38	99.70	0.00	0.00	1.01	1.01	2.99	5.01	0.00	0.00	1.00
Grain 3 T2	1	0	7.48	7.27	0.18	26.51	61.99	103.25	0.62	0.34	0.01	1.34	2.67	4.97	0.64	0.35	0.01
	3	284	7.67	7.04	0.37	25.05	61.25	101.38	0.65	0.33	0.02	1.30	2.69	5.00	0.65	0.33	0.02
	4	492	7.29	6.80	0.25	24.65	60.78	99.78	0.63	0.32	0.01	1.29	2.71	4.97	0.65	0.33	0.01
	5	568	7.99	6.26	0.47	25.03	62.99	102.75	0.67	0.29	0.03	1.28	2.72	4.99	0.68	0.29	0.03
	6	710	7.82	6.78	0.26	24.96	60.68	100.50	0.67	0.32	0.01	1.30	2.69	5.00	0.67	0.32	0.01
	7	850	6.98	7.14	0.29	24.77	61.63	100.81	0.60	0.34	0.02	1.29	2.71	4.95	0.63	0.36	0.02
	8	992	6.83	6.00	0.86	26.39	60.13	100.20	0.59	0.28	0.05	1.38	2.67	4.96	0.64	0.31	0.05
	9	1134	7.45	6.88	0.44	24.90	62.23	101.89	0.63	0.32	0.02	1.28	2.72	4.97	0.65	0.33	0.03
Grain 6 T3	1	0	6.49	8.38	0.05	26.34	60.31	101.52	0.55	0.39	0.00	1.36	2.64	4.95	0.42	0.58	0.00
	2	75	7.29	7.51	0.07	26.43	60.76	102.00	0.62	0.35	0.00	1.36	2.65	4.98	0.36	0.63	0.00
	3	150	7.04	8.18	0.04	25.92	60.26	101.40	0.60	0.39	0.00	1.34	2.65	4.98	0.39	0.61	0.00
Grain 2 T4	1	0	6.88	8.41	0.05	27.19	60.69	103.16	0.58	0.39	0.00	1.39	2.62	4.97	0.40	0.59	0.00
	2	129	5.98	9.93	0.14	27.69	57.78	101.38	0.51	0.47	0.01	1.44	2.55	4.98	0.47	0.52	0.01
	3	258	7.10	8.40	0.18	27.12	59.84	102.46	0.60	0.39	0.01	1.39	2.61	4.99	0.39	0.60	0.01
	4	387	6.59	8.24	0.08	26.16	60.59	101.58	0.56	0.39	0.00	1.35	2.65	4.95	0.41	0.59	0.00
	5	516	6.23	8.59	0.13	26.74	59.17	100.73	0.53	0.41	0.01	1.39	2.62	4.95	0.43	0.56	0.01

Table 6.4: Representative muscovite analyses from sample 208 with 'c' representing a core analysis. See Table 6.3 - Appendix 6 for complete data set.

	Oxide percentage								Cations on an 11 (O) basis							
#	Na_2O	K_2O	SiO_2	Al_2O_3	FeO	MgO	TiO_2	Total	Na	K	Si	Al	Fe	Mg	Ti	Total
1c1	0.00	9.04	47.51	35.26	1.65	1.37	1.00	95.82	0.00	0.76	3.11	2.72	0.09	0.13	0.05	6.86
1r1	0.00	8.83	46.78	34.49	1.62	1.12	1.21	94.06	0.00	0.75	3.12	2.71	0.09	0.11	0.06	6.84
1c2	0.53	9.33	46.93	34.39	1.79	1.25	1.19	95.40	0.07	0.79	3.11	2.68	0.10	0.12	0.06	6.92
1r2	0.48	9.09	46.10	33.60	1.53	1.21	1.14	93.15	0.06	0.78	3.12	2.68	0.09	0.12	0.06	6.91
2c	0.00	8.79	46.98	34.81	1.48	1.09	1.37	94.53	0.00	0.74	3.11	2.72	0.08	0.11	0.07	6.83
2r	0.00	9.11	46.51	34.11	1.47	1.24	1.35	93.78	0.00	0.78	3.12	2.69	0.08	0.12	0.07	6.86

CHAPTER 7: PETROLOGY AND METAMORPHIC INTERPRETATION OF METAPELITE FROM A SHEAR ZONE - AREA #4

Metapelite also occurs within a shear zone that marks the southern boundary of the SW Gagnon terrane. In contrast to the rocks described in the previous chapters, these metapelites contain sillimanite instead of kyanite and occur as tectonic layers and elongated pods in granitic material alternating with quartzite, and granitic, tonalitic, and mafic gneisses. The samples selected for this study (sample 287 - specimens A and B; sample 288 - specimens A, B and C) are Fe-rich as shown by the bulk chemical analysis of specimens 287B ($X_{Mg} = 0.38$) and 288A ($X_{Mg} = 0.32$) (Table 1.1 - Appendix 1). Specimen 287B has a typical pelite composition, whereas specimen 288A is richer in silica and poorer in aluminum, magnesium, iron and potassium.

7.1 MINERALOGY AND TEXTURE

Samples 287 and 288 are texturally heterogeneous and contain variable proportions of garnet, plagioclase, sillimanite, K-feldspar, quartz, biotite and trace muscovite (sample 288 only). Plagioclase and sillimanite are not present in specimen 287A.

Specimens 288A, 288B, 288C and 287B consist of coarse-grained quartzofeldspathic layers alternating with elongate finer-grained pods rich in sillimanite (Plate 7.1), which are mainly associated with garnet. The coarse-grained layers are composed predominantly of quartz ribbons (Plate 7.2), which are parallel to the foliation defined by the pods (Plate 7.3), plagioclase and K-feldspar. K-feldspar is variably replaced by muscovite along the cleavage (Plate 7.4) and also displays sericitic alteration. Also present are garnet porphyroblasts and a minor amount of fine-grained biotite, sillimanite and rutile which are dispersed amongst the quartz and feldspar, and are also associated with the garnet. The fine-grained pods consist of sillimanite, garnet, plagioclase and biotite, and commonly surround garnet porphyroblasts. Sillimanite occurs in a variety of forms ranging from fibrolite, which is locally intergrown with fine-grained biotite and quartz (Plate 7.5) and locally surrounds quartz and larger biotite grains (specimen 288C), to acicular and rod-shaped grains. Garnet occurs as subidioblastic porphyroblasts up to 3000 μm in diameter (Plate 7.6 and 7.7) and xenomorphic relict grains, the latter being restricted to the fine-grained pods. Garnet contains inclusions of quartz, biotite, plagioclase and locally apatite, xenotime and rutile in the rims of some grains. Garnet porphyroblasts in contact with the fine-grained pods and layers are variably corroded (Plate 7.8), whereas elsewhere they are rimmed by individual grains of biotite. Most corroded are the garnet porphyroblasts of specimen 288C (Plate 7.9).

Specimen 287A consists predominantly of large mesoperthite grains, (up to 3000 μm in diameter) and finer-grained microcline (Plate 7.10). Garnet is present as both porphyroblasts up to 4000 μm in diameter and sub-millimeteric relics that contain inclusions of quartz and biotite. Fine-grained biotite rims the garnet and larger biotite laths (up to 1500 μm in length) are dispersed in the matrix.

Interpretation

The presence of sillimanite and K-feldspar indicates that the samples have experienced dehydration melting of muscovite by the reaction Ms + Qtz + Ab = Kfs + Als + L ([R1], Figure 2.7) and have reached the *P-T* field of dehydration melting of biotite by the continuous reaction: Bt + Als + Ab + Qtz = Grt + Kfs + L (reaction [R2], Figure 2.7). However, the textural evolution of these rocks, at least in part, occurred in the sillimanite field, unlike the kyanite-bearing metapelites described in the previous chapters.

The coarse-grained, quartz-rich, K-feldspar-bearing domains of the samples are interpreted as leucosome, mixed, in the case of layers with quartz ribbons, with excess quartz representing solid residuum. The microcline twinning of some of the K-feldspar grains (specimen 287A) is consistent with slow cooling. On the other hand, pods with fine-grained plagioclase, biotite, fibrolite and prismatic sillimanite commonly associated with corroded garnet likely represent products of melt crystallization by reaction [R2] acting in the reverse sense, consuming garnet. Finally, the presence of retrograde muscovite along the cleavage planes of K-feldspar is likely a product of a subsolidus reaction, unrelated to melt crystallization, promoted by fluid infiltration at some late stage of the retrograde evolution.

7.2 MINERAL COMPOSITION

Only minerals from specimen 288A were analysed due to the lack of suitable garnet from specimens 288B and 288C and from sample 287.

7.2.1 Garnet

Two subidioblastic garnets (Garnet I: Plate 7.6, Figures 7.1 and 7.2; Garnet II: Plate 7.7, Figure 7.3 and 7.4) were analyzed along two rim-core-rim traverses each. The two porphyroblasts have similar compositions (Table 7.1, Tables 3.16 to 3.19 - Appendix 3) (Grs_{5-8}, Sps_{2-4}, Alm_{66-72}, Prp_{18-26}) and display homogeneous cores (Grs_{5-7}, Sps_{2-3}, Alm_{66-68}, Prp_{23-26}), except for localized zoning adjacent to inclusions, and zoned rims of variable width. Rim zoning is more pronounced in Garnet II and is characterized by a decrease in Prp (25%→22-18%) compensated by an increase in Alm (67%→68-72%) and, locally Grs and Sps. In addition, Garnet II displays a Prp trough compensated by an Alm peak next to one of the rims. In terms of trace elements, P tends to increase at the rims in both garnets and Cr, Y and Sc increase slightly towards the rims of Garnet II. Cr also increases towards some rims of Garnet I .

Interpretation

Chemically homogeneous garnet cores (Figures 7.1a, 7.2a, 7.3a and 7.4a) suggest chemical homogenization at high temperatures. In addition, due to the small size of the analyzed garnets (Plates 7.6 and 7.7), it is possible that diffusional resetting occurred at the grain scale during cooling. Therefore, zoning patterns in garnet do not allow distinction between a core that grew by subsolidus reactions and rims that grew by reaction [R2] during biotite dehydration melting. It may also be possible, however, that both garnet grew entirely in the presence of melt by reaction [R2] which would not result in a chemical distinction between the core and the rim.

Evidence in support of garnet rim growth by reaction [R2] includes the slight increase in Cr and P towards most rims (Figures 7.1b, 7.2b, 7.3b and 7.4b) which is consistent with biotite consumption and increased breakdown of apatite and\or other phosphates during melting respectively. Outwards increase of X_{Fe} in some rims, together with increase in Sps, is consistent with garnet breakdown by reaction [R2] in the reverse sense during cooling. This is in agreement with textural evidence of garnet corrosion by biotite and fibrolite. In this context, local increase of Grs in the same rims may be attributed to more extensive breakdown of Prp and Alm relative to Grs, leaving excess Grs behind.

7.2.2 Biotite

The composition of biotite (Table 7.2, Table 4.7 - Appendix 4) is a function of the microtextural setting with the grains included in and in contact with garnet having lower X_{Fe} (0.41-0.49) compared to the grains adjacent to garnet and isolated in the matrix (0.47-0.55) (Figure 7.5). Individual grains are essentially homogeneous with the exception of one grain included in Garnet II showing an outwards decrease in X_{Fe} (0.45→0.41) and a grain adjacent to the same garnet showing an outwards increase in X_{Fe} (0.41→0.44). Ti contents range between 0.14 and 0.24 p.f.u. in grains associated with garnet, and 0.18 and 0.30 p.f.u. in matrix grains isolated from garnet. Therefore, there is a direct correlation between Ti and X_{Fe}. Finally, there is an inverse correlation Al^{VI} and Ti (Figures 7.6c and 7.7c).

Lack of X_{Fe} enrichment in biotite grains replacing garnet is consistent with extensive Fe-Mg exchange between these two minerals after the closure of the garnet-consuming reaction during cooling. Lowest X_{Fe} in biotite grains adjacent to garnet indicates that efficiency of this exchange decreased with increasing distance from garnet (see section 2.4.3.2). Inverse correlation between Ti and distance from garnet indicates that biotite grains close to garnet formed at lower temperatures than isolated matrix grains during retrogression, whereas in the case of grains included in garnet, lower Ti is consistent with growth along a the prograde path.

7.2.3 Plagioclase

Two textural types of plagioclase were analysed (Table 1.1 - Appendix 1): (1) plagioclase in fine-grained pods partially replacing garnet and (2) matrix plagioclase isolated from garnet. In all cases, plagioclase composition falls in a narrow range (An 32-40%, Table 7.3, Table 5.6 - Appendix 5). Cores of individual grains are either homogeneous or display an outward decrease in An (Figure 7.8a). In general, An increases in the outer rims (Figure 7.8b) with the exception of two grains in which it decreases. There is no observed correlation between An zoning and microtexural setting.

Outwards decrease in An may be a growth feature related to progressive crystallization of plagioclase from the melt during cooling. The increase in X_{An} at some rims, on the other hand, is probably due to local Grs consumption during cooling .

7.3 SUMMARY AND *P-T* CONSTRAINTS

Samples 287 and 288, from the shear zone that bounds the SW Gagnon terrane to the south (Figure 1.2), display textural features consistent with dehydration melting of micas in the sillimanite field.

The absence of primary muscovite and the presence of K-feldspar and sillimanite indicate that *P-T* conditions of the reaction Ms + Qtz + Ab = As + Kfs + L were exceeded and the sample has reached the *P-T* field of biotite dehydration melting by the continuous reaction Bt + Qtz + As = Grt + Kfs + L (shaded area in Figure 7.9). Coarse quartz + K-feldspar-bearing areas are interpreted as leucosome, with, in the case of quartz-rich layers, relict excess quartz representing solid residuum. However, it is not clear if the aluminosilicate produced in these reactions was kyanite or sillimanite because the sillimanite that is present in these samples is texturally retrograde (see below).

Owing to the general chemical homogeneity of garnet cores and retrogression of the rims it is not possible to evaluate the extent to which part of garnet grew in the presence of melt by the continuous biotite dehydration reaction. Nevertheless, local increase of Cr in some rims is consistent with this reaction.

In addition there are textural features related to melt crystallization.

(1) Fabric corroding garnet

The late sillimanite + biotite + plagioclase fabric which wraps around and corrodes garnet in the fine-grained pods is likely the product of melt crystallization during cooling within the shaded area of Figure 7.9.

(2) Late biotite and muscovite

The distribution of the biotite parallel to the late shear zone fabric suggests that this phase is all retrograde, and likely produced by reaction [R2] operating in the reverse sense during cooling (Figure 7.9). However, muscovite is likely a product of a subsolidus reaction that occurred after melt crystallization, because it is restricted along the cleavage planes of K-feldspar.

In conclusion, the samples from the shear zone contrast with those of the thrust slices to the north because they contain sillimanite instead kyanite and imply evolution, in part at least, in the sillimanite field. However, because sillimanite appears texturally to be retrograde, i.e., produced by melt crystallization, the possibility that kyanite was present along the prograde path at the peak, and was entirely consumed during dehydration melting of biotite, cannot be excluded. If this is the case, significant decompression between melt production and melt crystallization would be implied.

The uncertainty of which aluminosilicate phase was present at the peak, combined with the lack of growth zoning in garnet and the lack of subsolidus plagioclase and peak biotite hinders the use of X_{Fe} and GASP isopleths to constrain the prograde history of samples from this area. The widespread retrograde development of sillimanite and biotite, however, indicates that during the retrograde path, the melt crystallized mainly in the shaded area of Figure 7.9 by the reaction Bt + Qtz + Sil = Grt + Kfs + L in the reverse sense.

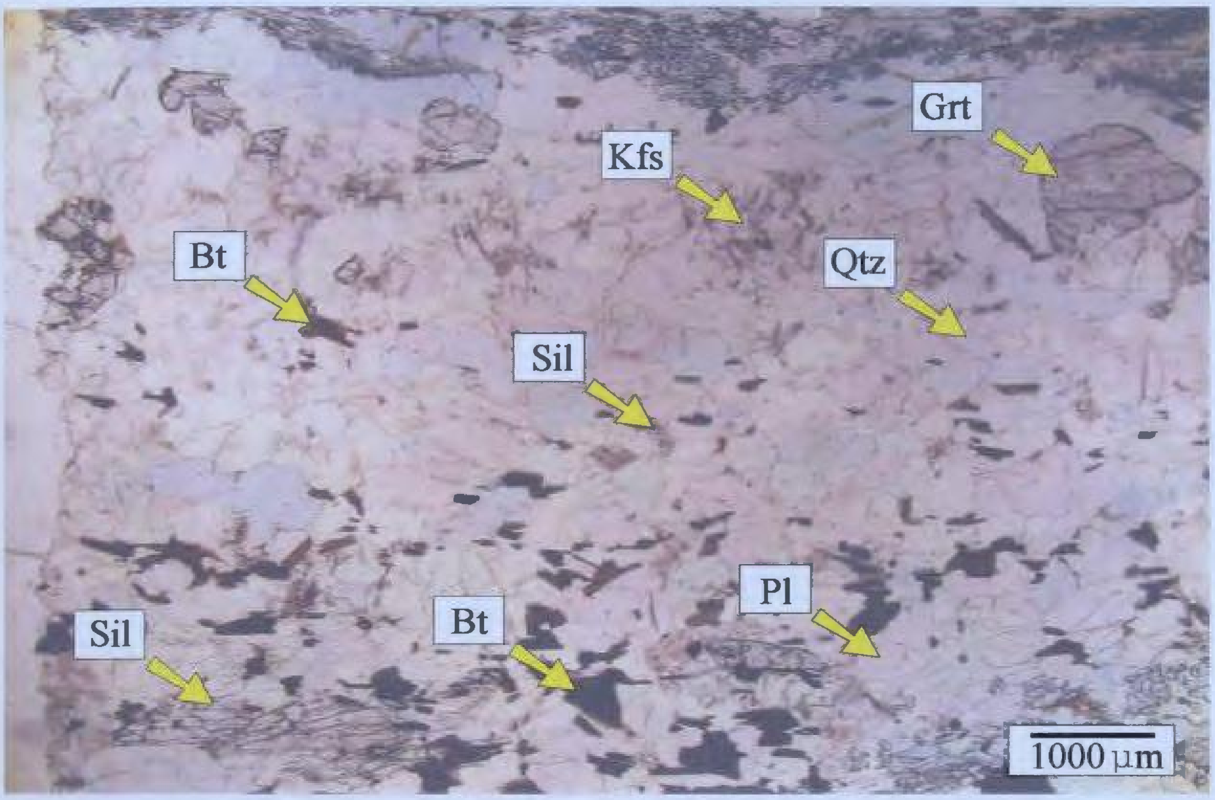


Plate 7.1: Coarse-grained quartzofeldspathic layer (center of photo), alternating with fine-grained pods of sillimanite, garnet, biotite and plagioclase that probably formed during melt crystallization (specimen 287B).

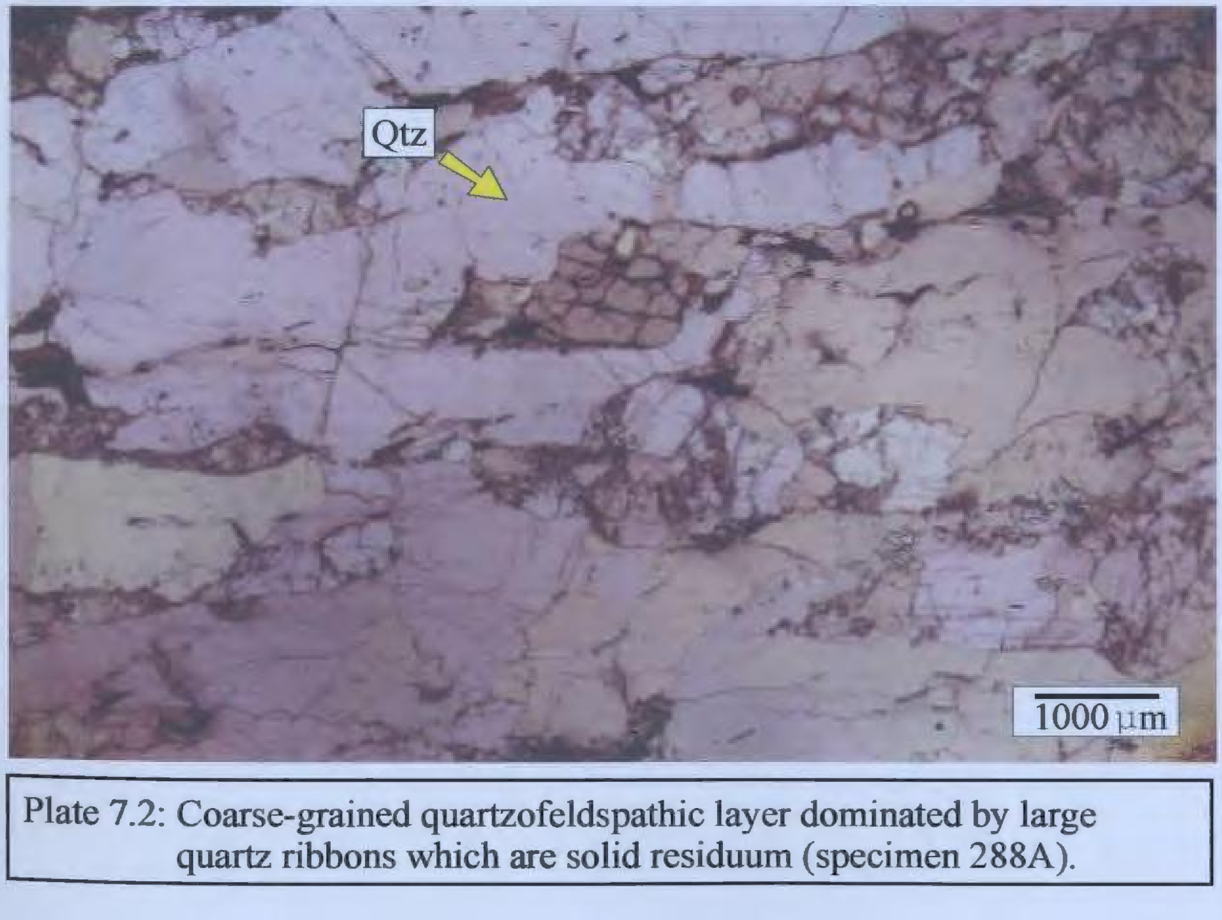


Plate 7.2: Coarse-grained quartzofeldspathic layer dominated by large quartz ribbons which are solid residuum (specimen 288A).

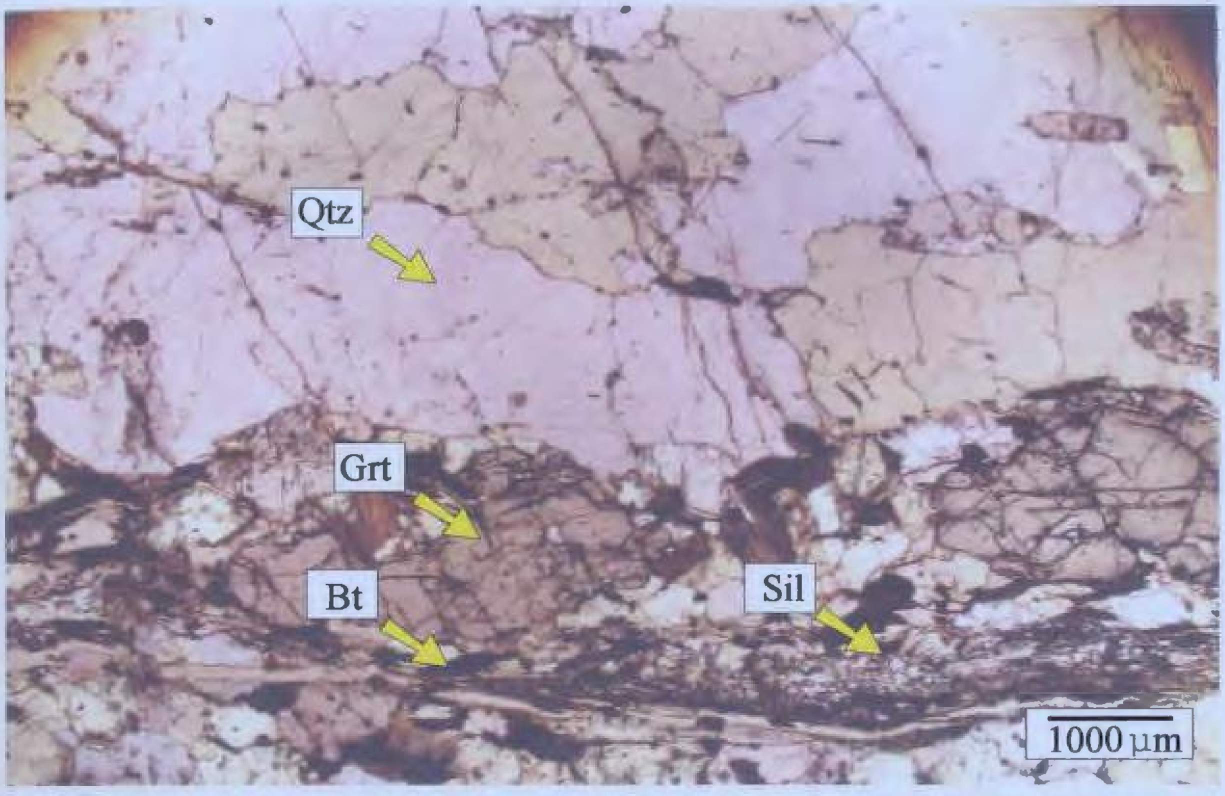


Plate 7.3: Quartz ribbons aligned parallel to garnet + sillimanite pods (specimen 288B).

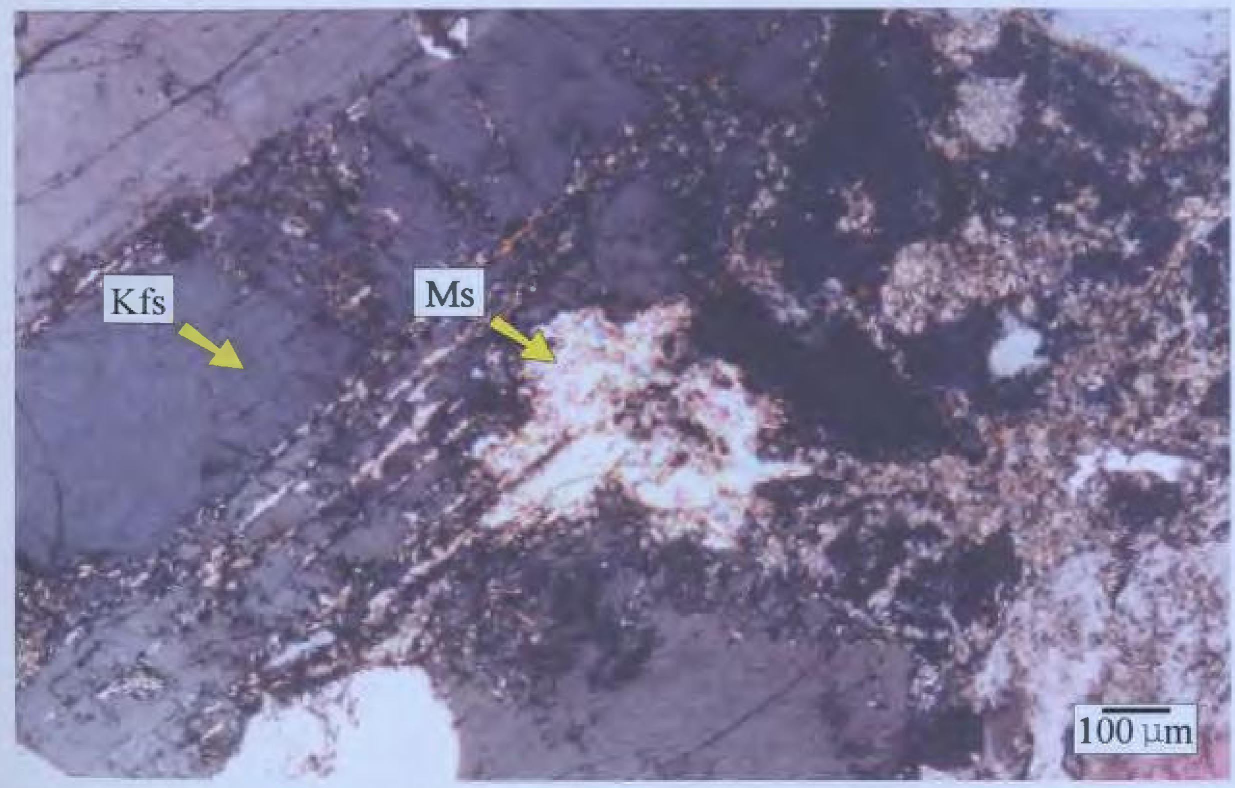


Plate 7.4: Retrograde muscovite replacing K-feldspar along cleavage planes as a result of subsolidus fluid infiltration (specimen 288A).

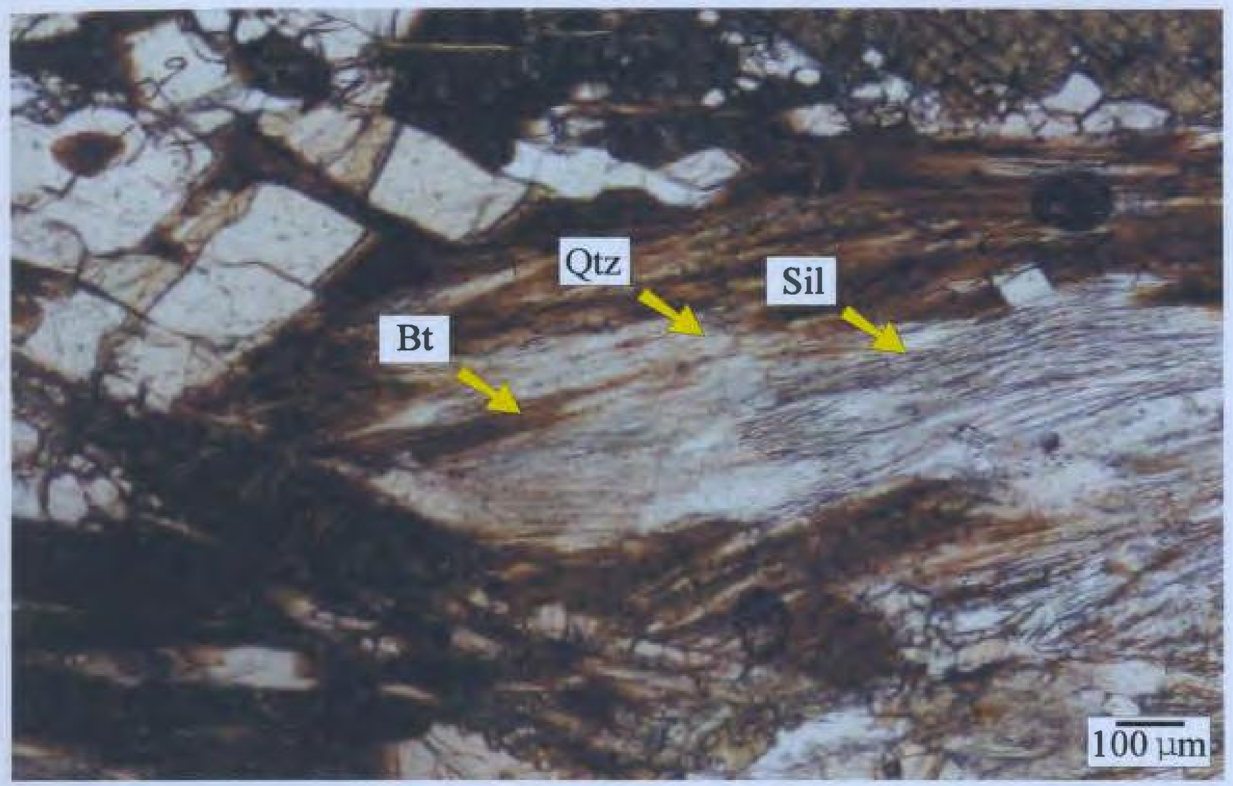


Plate 7.5: Retrograde prismatic sillimanite and fibrolite intergrown with biotite and quartz (specimen 288B).

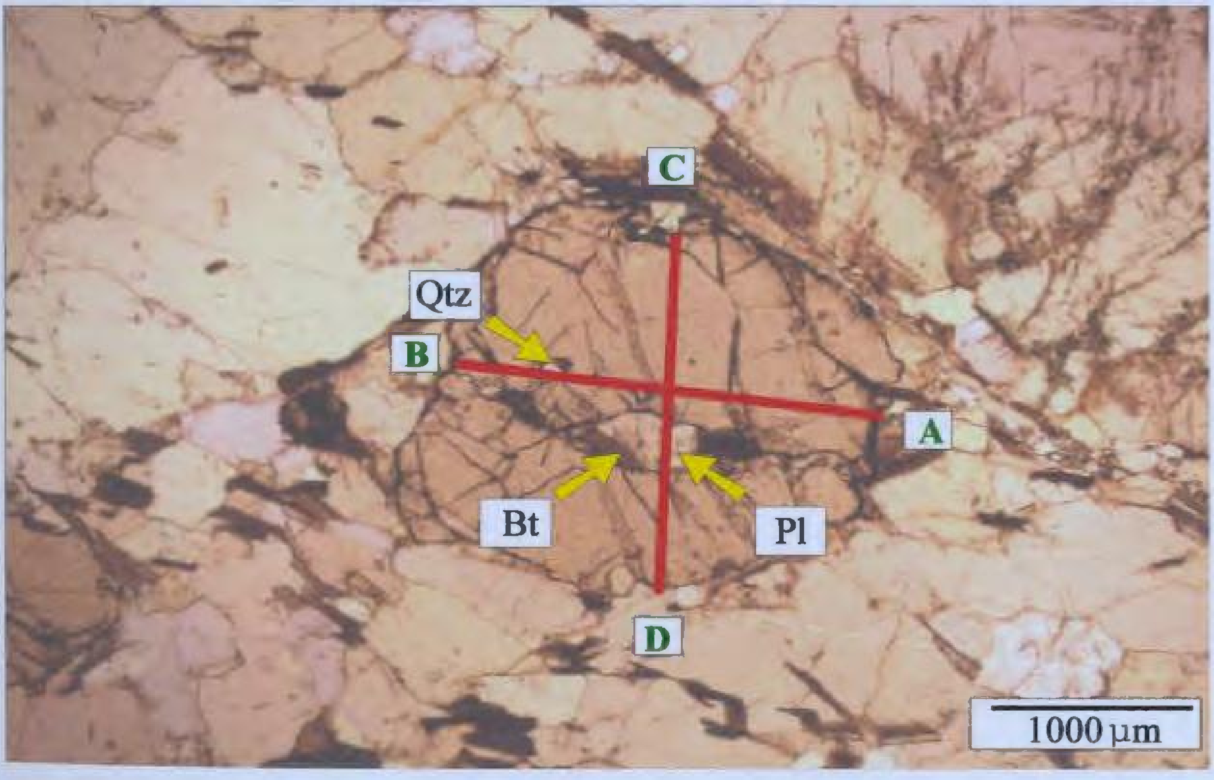


Plate 7.6: Garnet I from sample 288A which contains inclusions of plagioclase, biotite and quartz. Lines A-B and C-D indicate paths of microprobe analysis (see Figures 7.1 and 7.2).

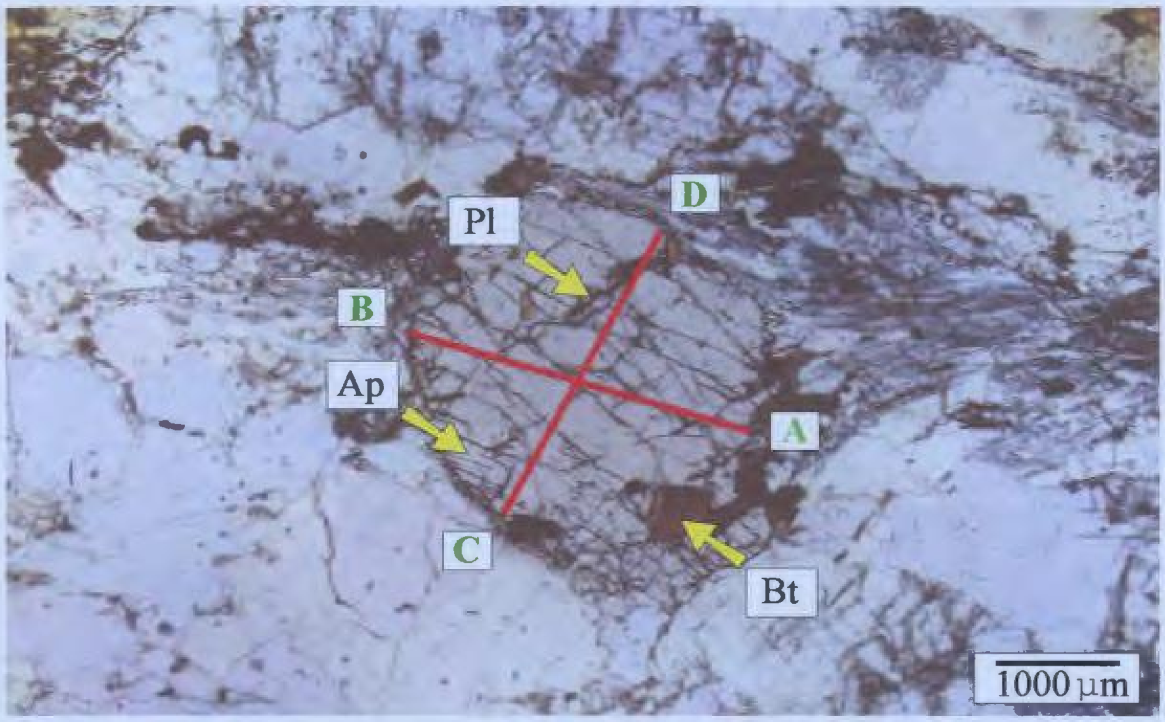


Plate 7.7: Garnet II from specimen 288A with inclusions of biotite, apatite, plagioclase and quartz. Lines A-B and C-D indicate paths of microprobe analyses (see Figures 7.3 and 7.4).

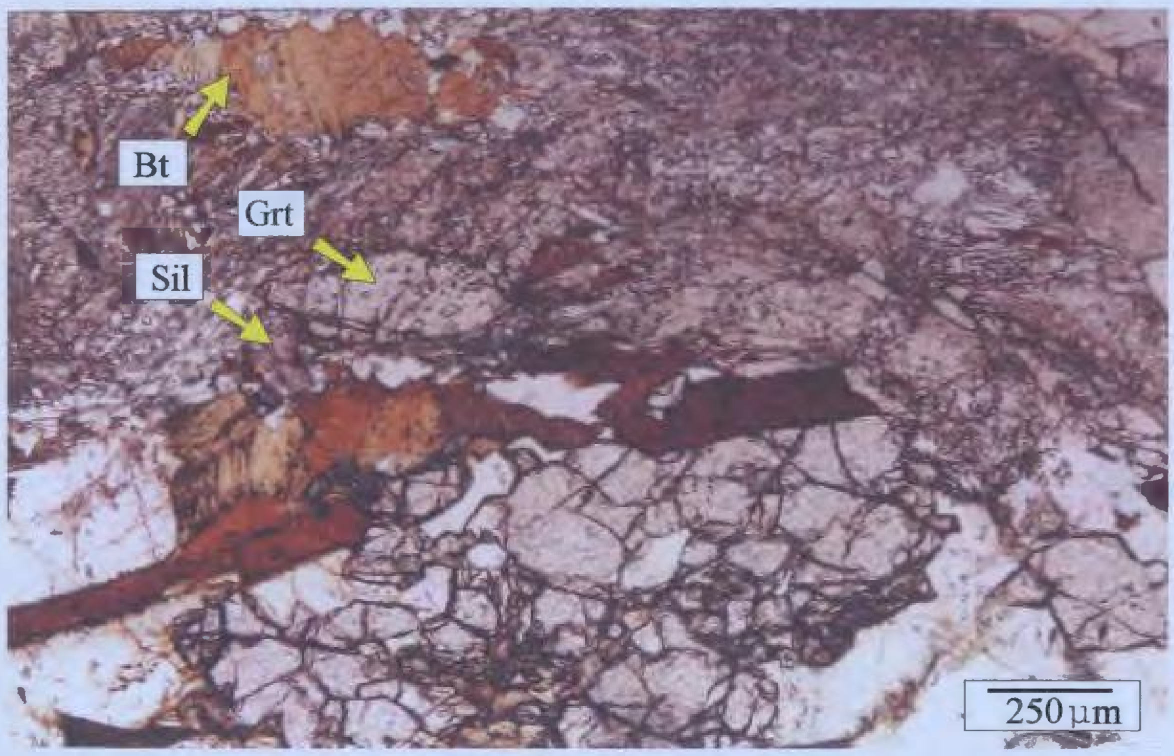


Plate 7.8: Garnet corroded by fibrolitic sillimanite and biotite (specimen 288C).

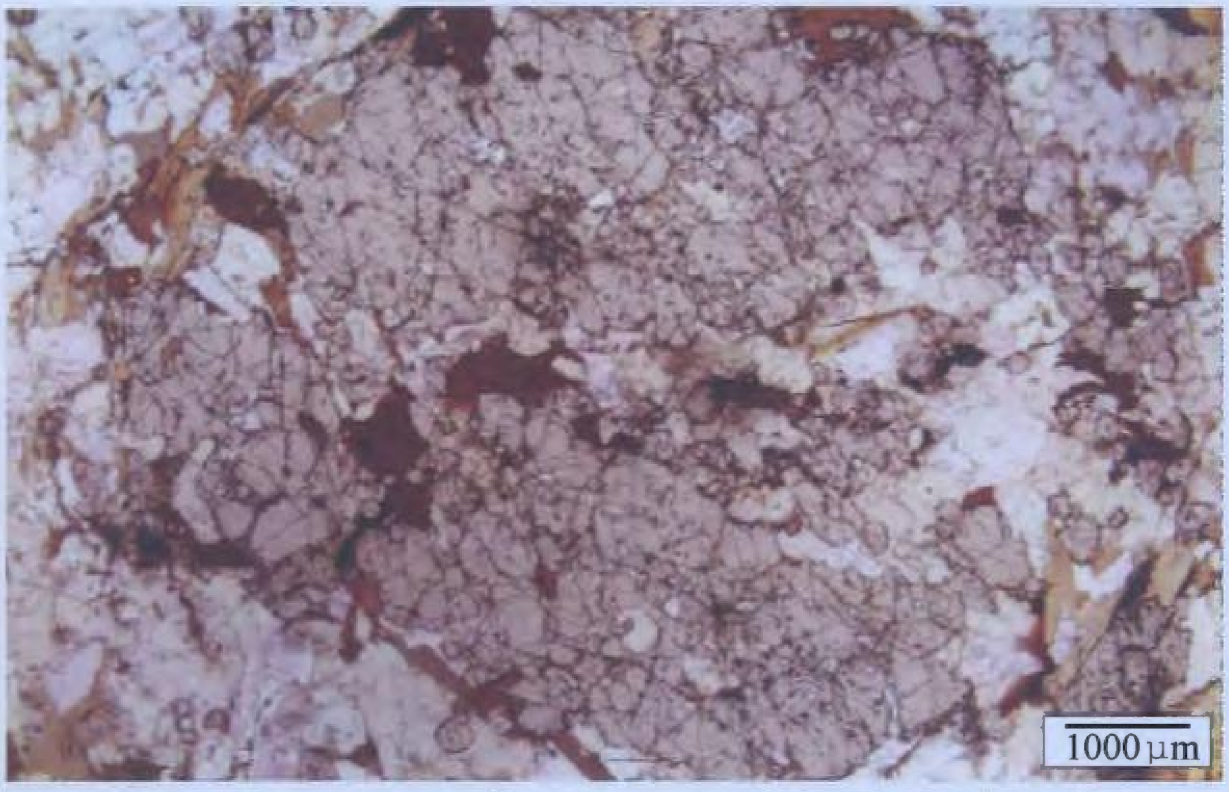


Plate 7.9: Extensive corrosion of garnet likely associated with melt crystallization (specimen 288C).

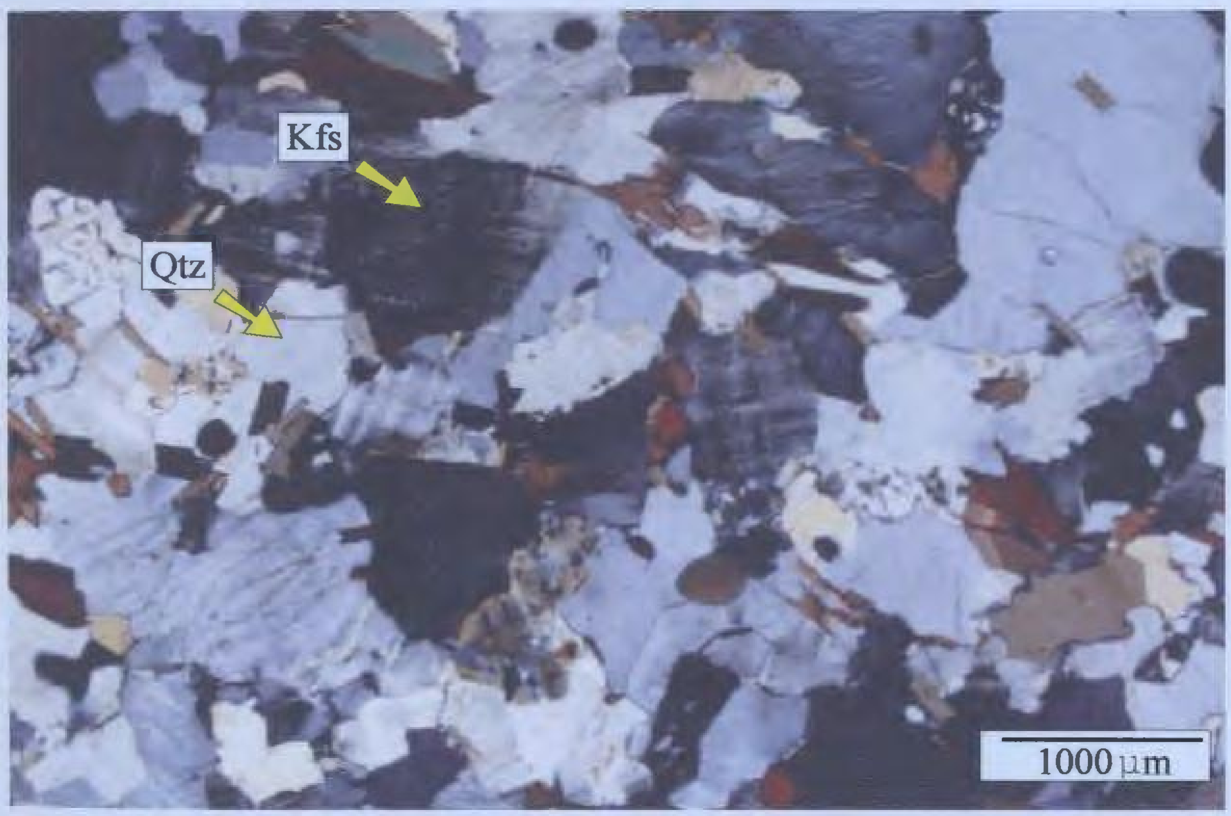


Plate 7.10: Quartzofeldspathic pod likely representing leucosome (specimen 287B).

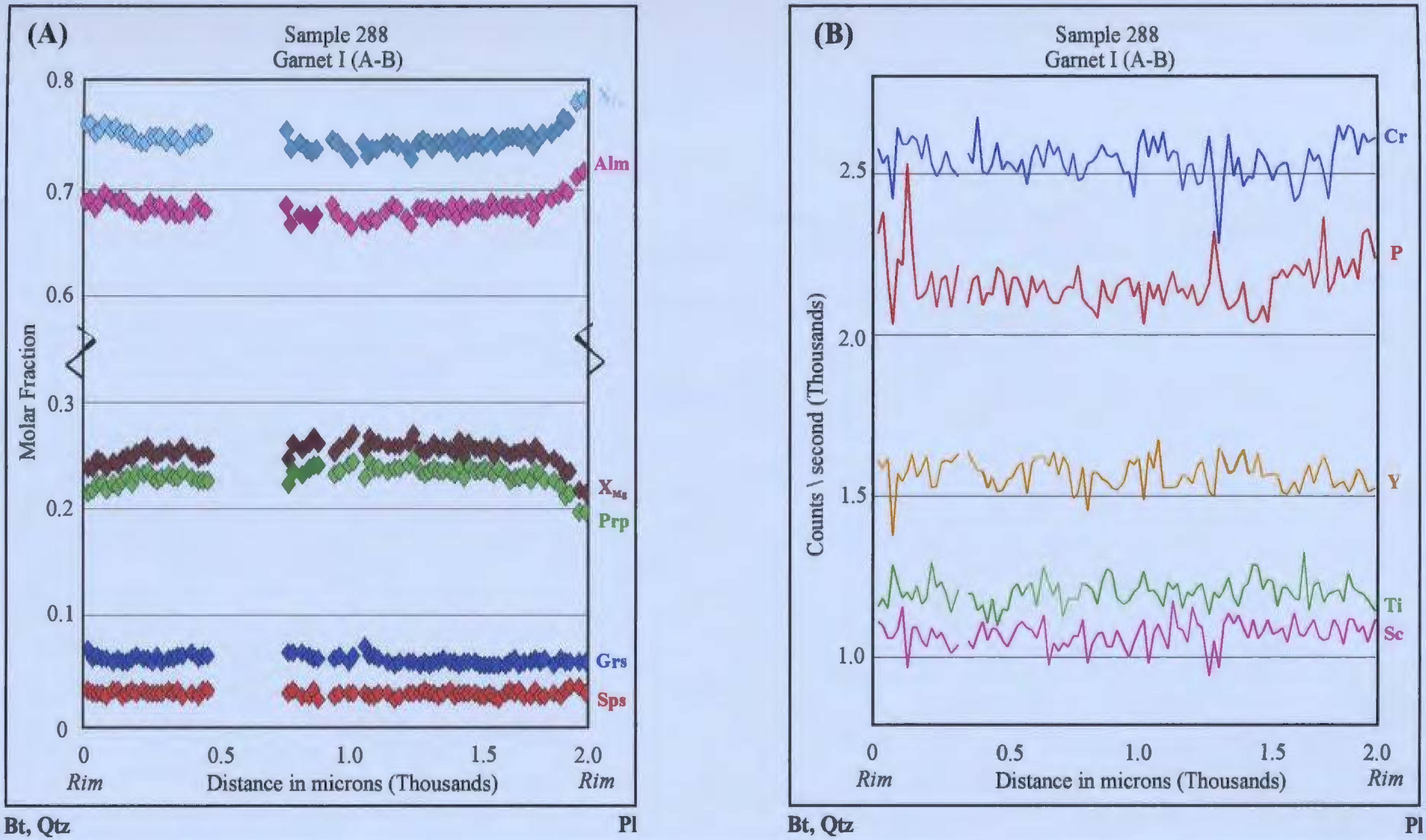


Figure 7.1: Zoning profiles of Garnet I from sample 288 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 7.6 for location of transect. Rim A is in contact with Bt and Qtz; rim B is in contact with Pl.

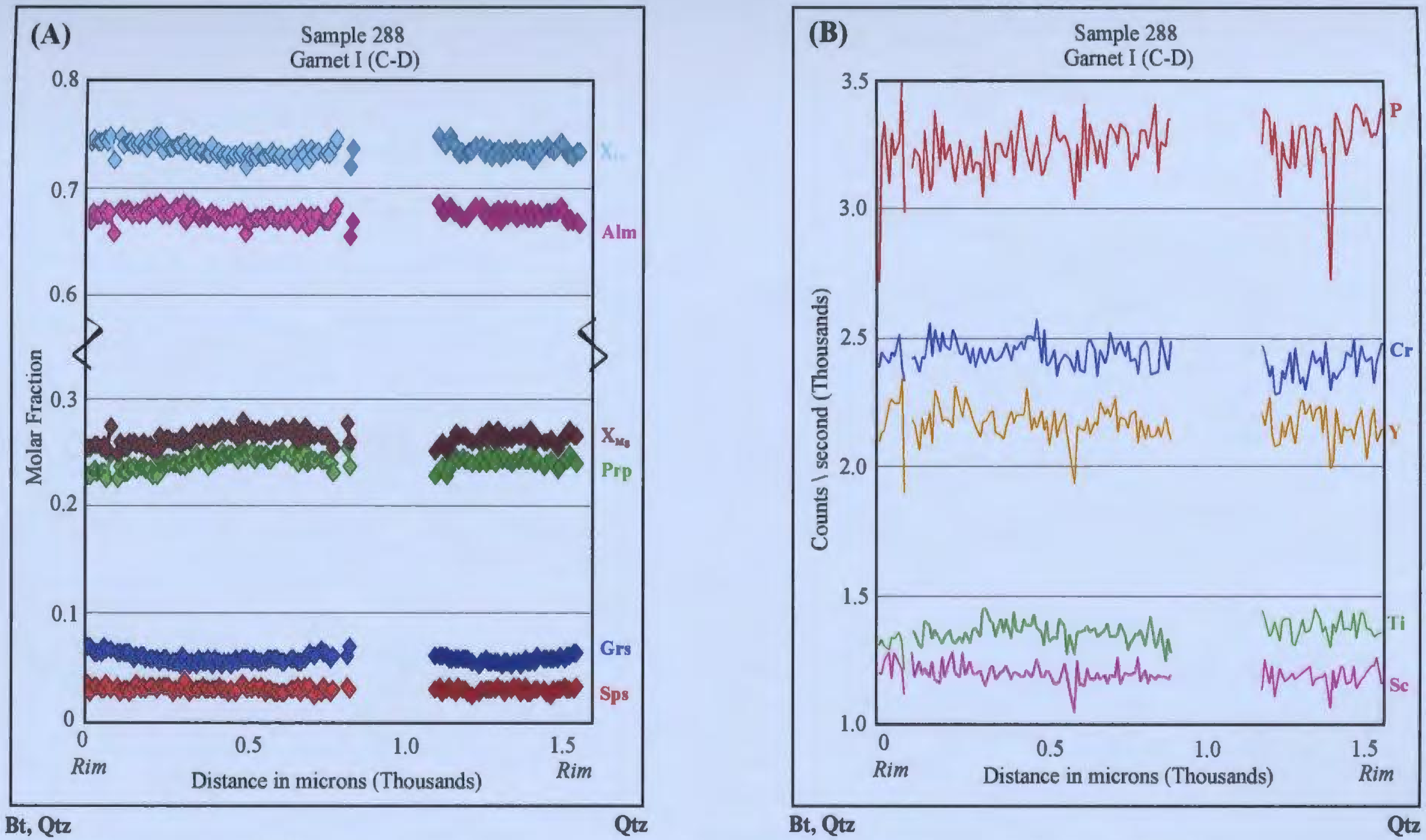


Figure 7.2: Zoning profiles of Garnet I from sample 288 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect C-D. See Plate 7.6 for location of transect. Rim A is in contact with Bt and Qtz; rim B is in contact with Qtz.

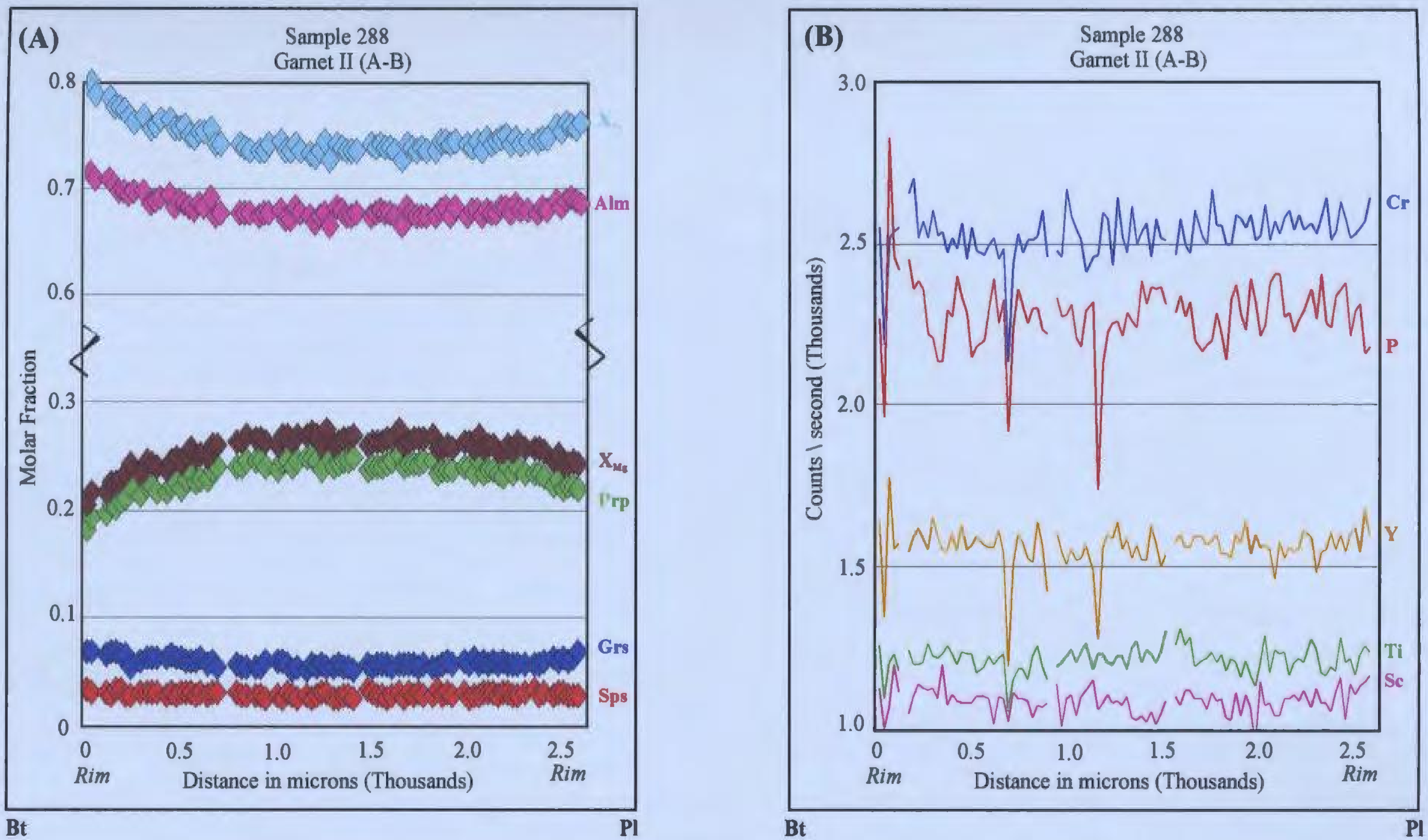


Figure 7.3: Zoning profiles of Garnet II from sample 288 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 7.7 for location of transect. Rim A is in contact with Bt; rim B is in contact with Pl.

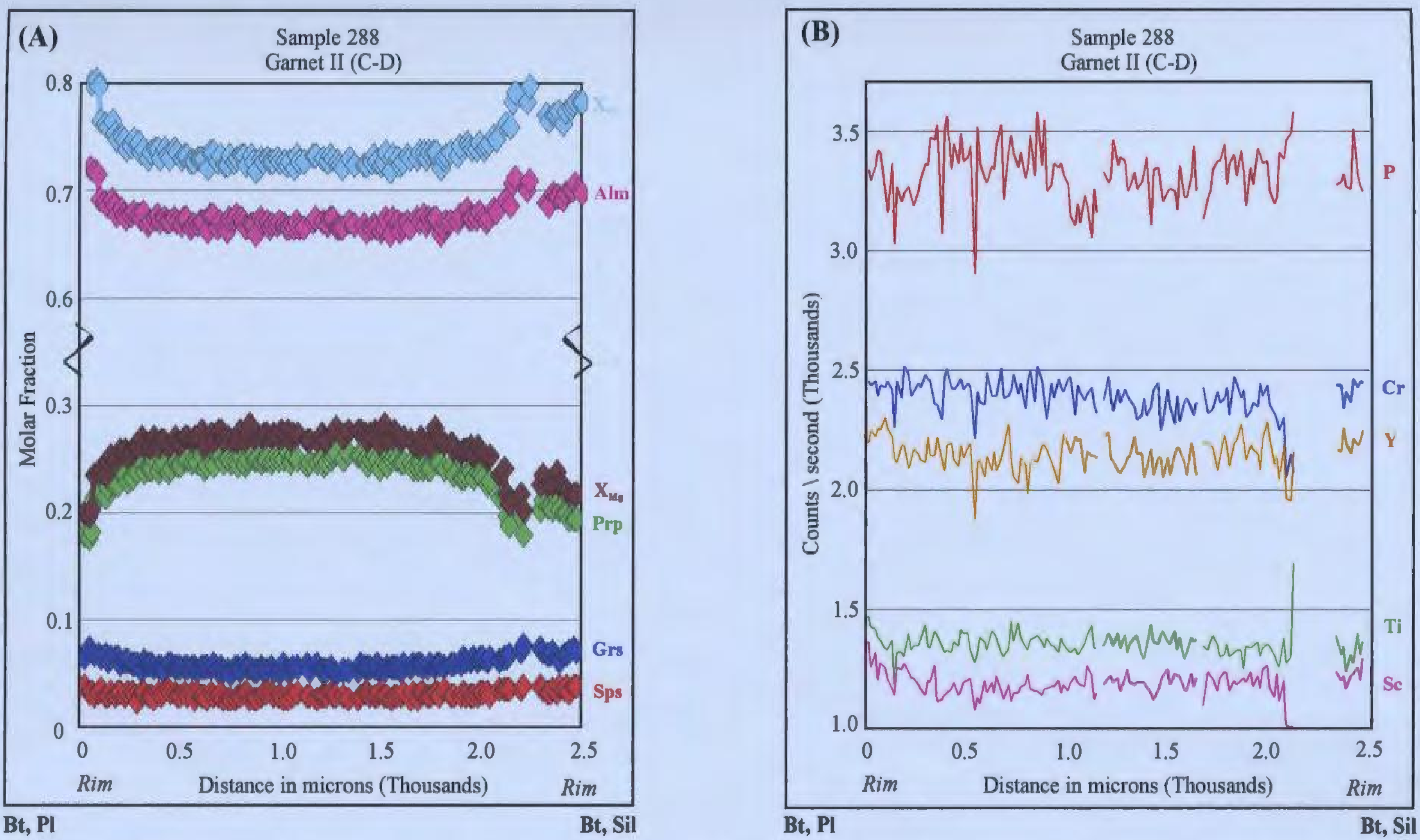


Figure 7.4: Zoning profiles of Garnet II from sample 288 in terms of (A) molar fractions of Grs, Prp, Alm, and Sps and (B) counts / second of P, Ti, Sc, Y, and Cr along transect C-D. See Plate 7.7 for location of transect. Rim A is in contact with Bt and Pl; rim B is in contact with Bt and Sil.

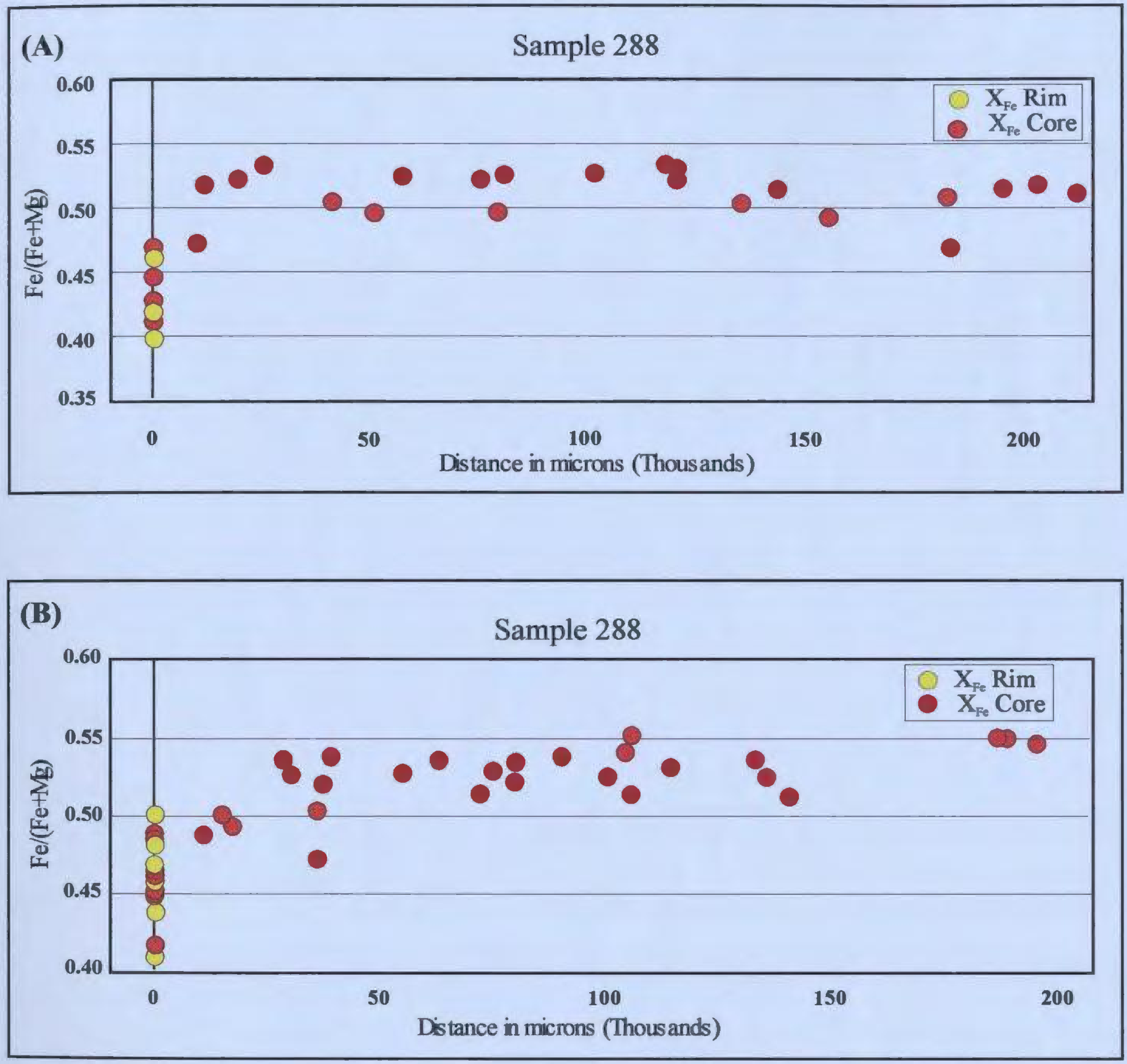


Figure 7.5: X_{Fe} biotite versus distance from (A) Garnet I and (B) Garnet II (sample 288).

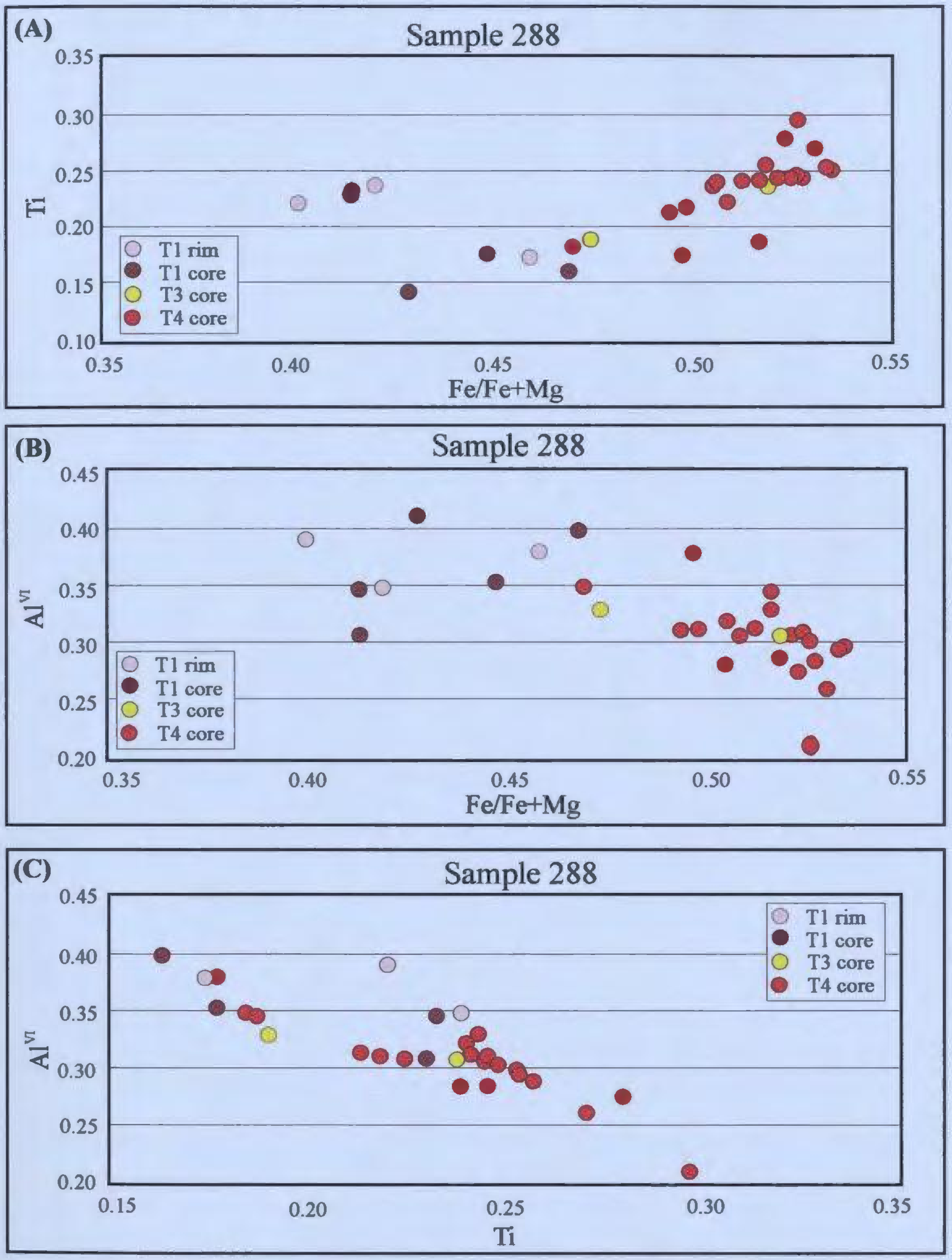


Figure 7.6: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet I.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet I.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite associated with Garnet I.
T1=biotite included in garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

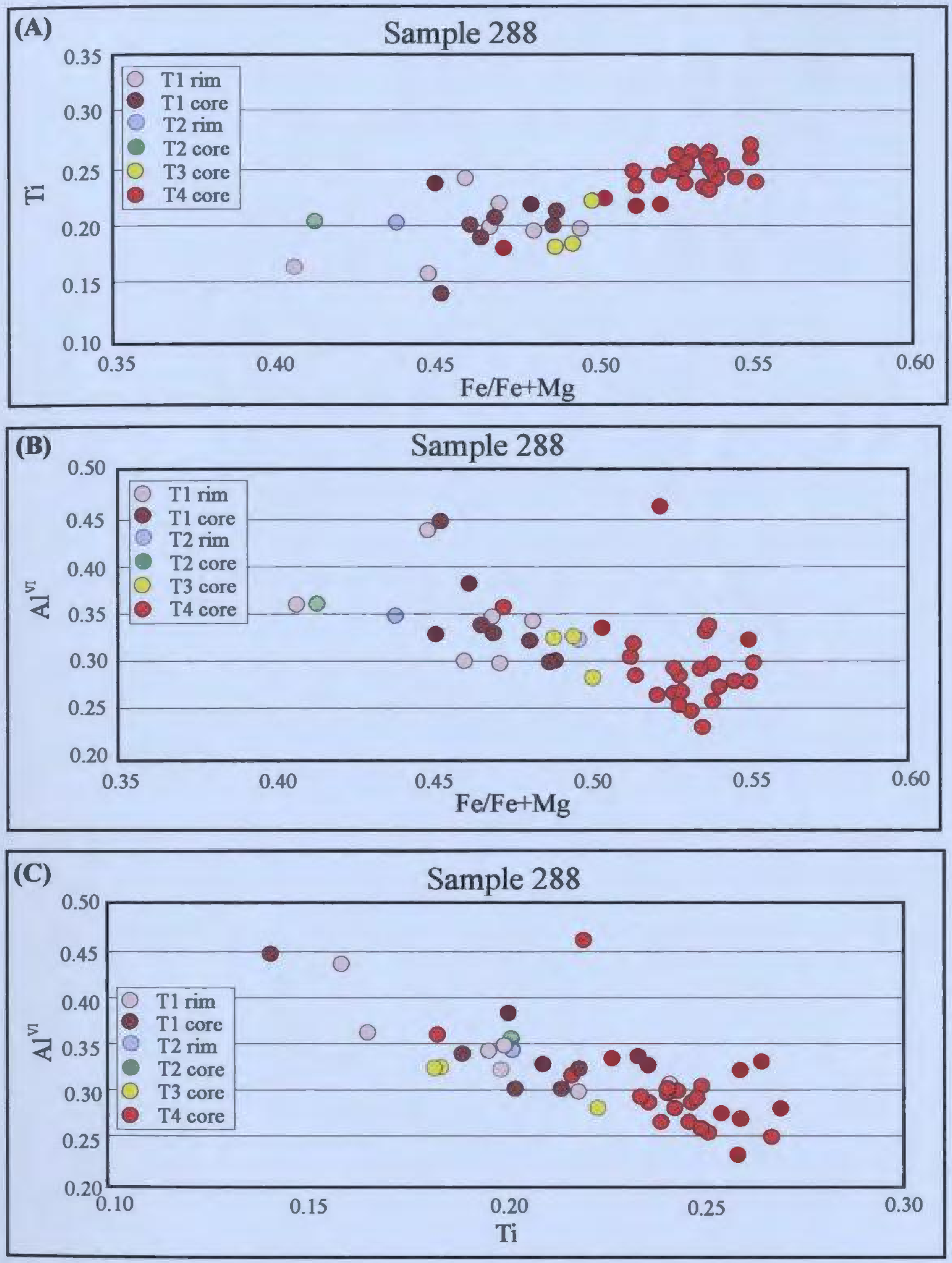


Figure 7.7: (A) Proportion of Ti (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet II.
(B) Proportion of Al^{VI} (p.f.u.) in octahedral sites of biotite versus Fe/Fe+Mg of biotite associated with Garnet II.
(C) Proportion of Al^{VI} (p.f.u.) versus Ti (p.f.u.) in octahedral sites of biotite associated with Garnet II.
T1=biotite included in garnet, T2=biotite in contact with garnet, T3=biotite adjacent to garnet, T4=biotite isolated in the matrix.

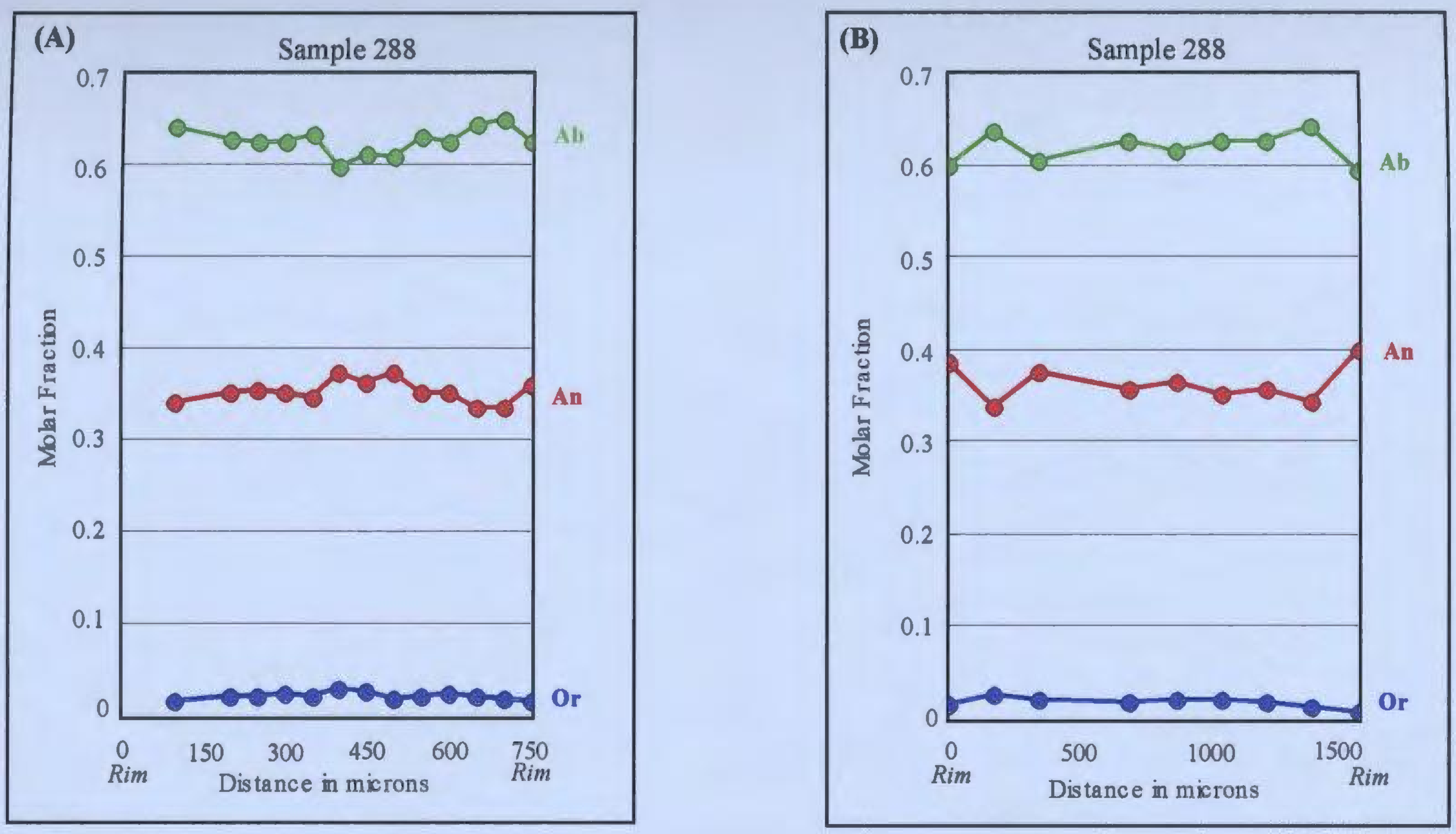


Figure 7.8: Zoning profiles of (A) a plagioclase grain in contact with Garnet II (T2) and (B) a plagioclase grain adjacent to Garnet II (T3), in terms of molar fractions of Ab, An, and Or.

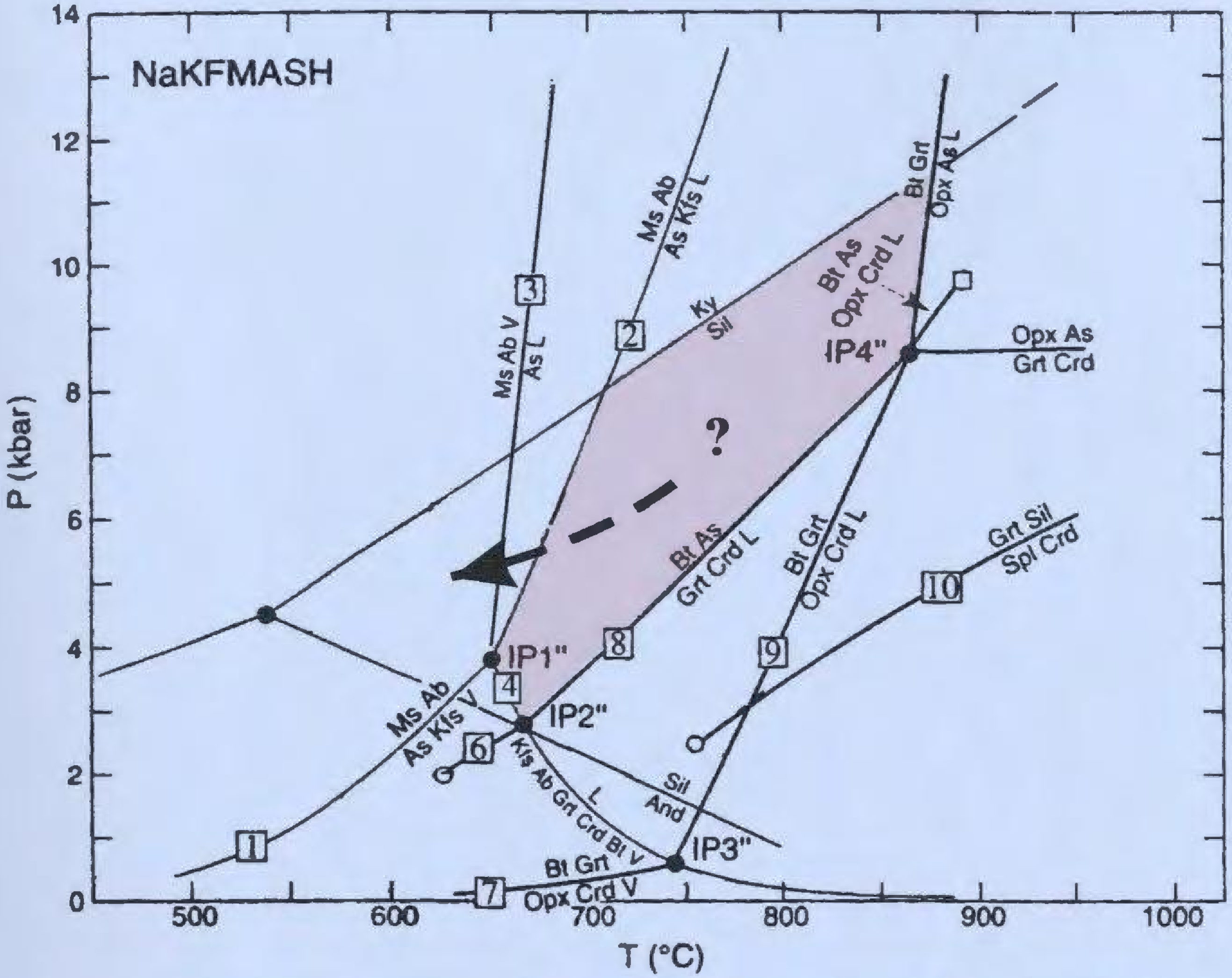


Figure 7.9: *P-T* diagram showing the locations of selected melting reactions in the NaKFMASH system (Modified after Spear et al. 1999) and a possible retrograde path for sample 288. The shaded area represents the field of the continuous reaction Bt + Ab + Sil + Qtz = Grt + Kfs + L.

Table 7.1: Representative garnet (Garnet I) analyses from specimen 288A - area #4. See Tables 16a, 17a , 18a and 19a - Appendix 3 for complete data set.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Type	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	rim	32.32	5.66	2.54	1.37	21.57	37.80	0.00	101.2	2.12	0.66	0.21	0.09	1.99	2.96	0.00	8.04	0.69	0.21	0.07	0.03	0.76	0.24
2	rim	32.88	5.81	2.27	1.35	21.75	38.02	0.01	102.0	2.14	0.67	0.19	0.09	1.99	2.96	0.00	8.04	0.69	0.22	0.06	0.03	0.76	0.24
3	rim	32.58	6.00	2.38	1.35	21.62	37.53	0.00	101.4	2.13	0.70	0.20	0.09	2.00	2.94	0.00	8.06	0.68	0.22	0.06	0.03	0.75	0.25
51	core	32.08	6.24	2.31	1.31	21.36	37.59	0.15	100.8	2.11	0.73	0.19	0.09	1.98	2.95	0.01	8.06	0.68	0.23	0.06	0.03	0.74	0.26
53	core	32.26	6.53	2.18	1.33	21.80	38.00	0.06	102.1	2.09	0.76	0.18	0.09	1.99	2.95	0.00	8.06	0.67	0.24	0.06	0.03	0.73	0.27
54	core	31.31	6.48	2.28	1.29	21.68	38.07	0.00	101.1	2.04	0.75	0.19	0.09	1.99	2.97	0.00	8.03	0.66	0.25	0.06	0.03	0.73	0.27

Table 7.2: Representative biotite analyses from specimen 288A - area #4. T1 = biotite included in garnet, T2 = biotite in contact with garnet, T3 = biotite adjacent to garnet and T4 = biotite isolated from garnet in the matrix. See Table 7-Appendix 4 for complete data set.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{VI}	Al^{IV}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
1r	1	8.84	36.21	18.87	15.32	12.53	0.00	2.94	94.72	0.84	2.70	1.30	0.36	0.96	1.39	0.00	0.17	7.72	0.41	0.59	0.33	0.48	0.13	0.06
1c	1	8.02	36.75	19.65	16.65	11.30	0.05	2.52	95.06	0.76	2.73	1.27	0.45	1.03	1.25	0.00	0.14	7.65	0.45	0.55	0.36	0.43	0.16	0.05
9r	2	8.77	34.37	18.08	15.39	11.06	0.07	3.43	91.11	0.87	2.68	1.32	0.35	1.01	1.29	0.00	0.20	7.72	0.44	0.56	0.35	0.45	0.12	0.07
9c	2	9.34	36.47	19.04	15.11	12.04	0.07	3.62	95.62	0.88	2.70	1.30	0.36	0.94	1.33	0.00	0.20	7.71	0.41	0.59	0.33	0.47	0.13	0.07
10c	3	9.55	35.60	17.88	18.36	10.29	0.06	3.93	95.62	0.92	2.69	1.31	0.28	1.16	1.16	0.00	0.22	7.75	0.50	0.50	0.41	0.41	0.10	0.08
29c	3	9.10	34.47	17.95	17.16	9.85	0.01	3.12	91.64	0.91	2.70	1.30	0.36	1.13	1.15	0.00	0.18	7.74	0.49	0.51	0.40	0.41	0.13	0.07
31c	4	9.66	37.02	18.89	18.42	10.18	0.00	4.13	98.29	0.90	2.71	1.29	0.34	1.13	1.11	0.00	0.23	7.70	0.50	0.50	0.40	0.40	0.12	0.08
32c	4	9.31	36.18	18.22	17.00	10.65	0.00	3.22	94.58	0.90	2.74	1.26	0.36	1.08	1.20	0.00	0.18	7.72	0.47	0.53	0.38	0.43	0.13	0.06

Table 7.3: Representative plagioclase analyses from specimen 288A - area #4. T1 = plagioclase included in garnet, T2 = plagioclase in contact with garnet, T3 = plagioclase adjacent to garnet and T4 = plagioclase isolated from garnet in the matrix. See Table 6 - Appendix 5 for complete data set.

Grain # and type	Analysis #	Distance	Oxide percentage						Cations on a 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 2 T2	1	0	6.82	7.93	0.27	26.41	59.46	100.88	0.58	0.38	0.02	1.38	2.63	4.98	0.60	0.39	0.02
	2	175	7.53	7.22	0.44	25.61	59.55	100.35	0.65	0.34	0.03	1.34	2.65	5.01	0.64	0.34	0.02
	3	350	6.95	7.78	0.37	25.39	59.28	99.78	0.60	0.37	0.02	1.34	2.65	4.99	0.60	0.37	0.02
	4	700	6.69	7.44	0.33	25.37	59.04	98.88	0.58	0.36	0.02	1.35	2.66	4.97	0.61	0.37	0.02
	5	875	7.50	7.76	0.30	25.74	59.19	100.48	0.65	0.37	0.02	1.35	2.64	5.02	0.63	0.36	0.02
	6	1050	7.14	7.64	0.35	25.86	60.12	101.10	0.61	0.36	0.02	1.35	2.65	4.99	0.62	0.36	0.02
	7	1225	7.24	7.33	0.37	25.28	59.24	99.45	0.63	0.35	0.02	1.34	2.66	5.00	0.63	0.35	0.02
	8	1400	7.38	7.59	0.31	25.27	58.97	99.53	0.64	0.37	0.02	1.34	2.65	5.01	0.63	0.36	0.02
	9	1575	7.29	7.03	0.23	25.25	59.67	99.47	0.63	0.34	0.01	1.33	2.67	4.99	0.64	0.34	0.01
	10	1750	6.94	8.45	0.12	26.20	59.18	100.77	0.60	0.40	0.01	1.37	2.62	4.99	0.59	0.40	0.01
Grain 3 T3	1	0	8.04	6.85	0.29	25.72	59.81	100.71	0.69	0.33	0.02	1.34	2.65	5.03	0.67	0.31	0.02
	2	52	7.62	7.32	0.29	25.11	59.10	99.44	0.66	0.35	0.02	1.33	2.66	5.02	0.64	0.34	0.02
	3	104	7.89	7.43	0.31	25.66	60.11	101.40	0.67	0.35	0.02	1.33	2.65	5.03	0.65	0.34	0.02
	4	156	7.39	7.52	0.37	25.43	59.57	100.27	0.64	0.36	0.02	1.34	2.65	5.01	0.63	0.35	0.02
	5	208	7.28	7.48	0.36	25.41	59.03	99.56	0.63	0.36	0.02	1.34	2.65	5.01	0.62	0.35	0.02
	6	260	7.29	7.43	0.39	25.27	59.81	100.20	0.63	0.35	0.02	1.33	2.66	5.00	0.63	0.35	0.02
	7	312	7.54	7.49	0.38	26.26	59.27	100.94	0.65	0.36	0.02	1.37	2.63	5.02	0.63	0.35	0.02
	8	364	6.80	7.67	0.48	25.12	59.15	99.23	0.59	0.37	0.03	1.33	2.66	4.98	0.60	0.37	0.02
	9	417	7.14	7.65	0.44	25.76	58.84	100.04	0.62	0.37	0.03	1.36	2.63	5.01	0.61	0.36	0.02
	10	469	7.02	7.82	0.32	25.52	58.97	99.64	0.61	0.38	0.02	1.35	2.64	5.00	0.61	0.37	0.02
	11	521	7.52	7.58	0.35	25.76	59.65	100.86	0.65	0.36	0.02	1.35	2.64	5.02	0.63	0.35	0.02
	12	573	7.19	7.29	0.42	25.45	58.88	99.23	0.63	0.35	0.02	1.35	2.65	5.00	0.63	0.35	0.02
	13	625	7.69	7.21	0.39	25.23	59.35	99.87	0.67	0.35	0.02	1.33	2.66	5.02	0.64	0.33	0.02
	14	677	7.73	7.21	0.32	25.63	59.25	100.13	0.67	0.34	0.02	1.35	2.64	5.02	0.65	0.33	0.02
	15	729	7.43	7.69	0.28	25.94	59.10	100.43	0.64	0.37	0.02	1.36	2.63	5.02	0.63	0.36	0.02

Grain 5 T4	1	0	5.96	6.01	0.71	26.27	54.21	93.38	0.55	0.31	0.04	1.48	2.58	4.98	0.61	0.34	0.05
	2	42	7.21	7.24	0.29	25.41	59.59	99.74	0.62	0.35	0.02	1.34	2.66	4.99	0.63	0.35	0.02
	3	83	7.15	7.33	0.23	25.21	59.74	99.66	0.62	0.35	0.01	1.33	2.67	4.98	0.63	0.36	0.01
	4	125	7.98	7.40	0.37	25.73	59.34	100.83	0.69	0.35	0.02	1.35	2.64	5.04	0.65	0.33	0.02
	5	167	7.79	7.34	0.37	25.65	59.94	101.31	0.67	0.35	0.02	1.33	2.65	5.03	0.64	0.34	0.02
	6	208	7.61	7.12	0.31	25.68	59.72	100.44	0.66	0.34	0.02	1.35	2.65	5.01	0.65	0.33	0.02
	7	250	7.79	7.33	0.32	25.93	59.60	100.97	0.67	0.35	0.02	1.35	2.64	5.03	0.65	0.34	0.02

CHAPTER 8: ANATECTIC METAPELITES FROM OTHER AREAS OF THE GAGNON TERRANE

Evidence of partial melting of quartzofeldspathic and pelitic rocks has also been reported in the eastern Gagnon terrane in rocks assigned to metamorphic zones 6 and 7 (see section 1.5). In northeastern most Gagnon terrane, leucosomes in zone 6 are generally associated with semipelitic (muscovite-free) rocks and are attributed to the vapor-present reaction Qtz + Pl + Kfs + H_2O = L (Rivers 1983a; van Gool 1992) while muscovite-bearing pelitic rocks in this area do not show evidence for partial melting. Further south in the Lac Opocopa (Indares 1995) and the Lac Audréa areas (Schwarz 1998), however, there is a transition to muscovite-absent, K-feldspar and kyanite-bearing assemblages in metapelite which are indicative of dehydration partial melting of micas (zone 7). Although these areas have undergone previous study, the results were not fully interpreted with respect to partial melting processes. Therefore, the objective of this chapter is to reinterpret textures and garnet zoning in leucosome and garnet + kyanite (± K-feldspar) bearing rocks from the transition between zones 6 and 7 in terms of partial melting history and, where appropriate, revise previous *P-T* estimates accordingly. To this end, additional compositional data were obtained, including X-ray maps and trace element profiles of garnet which were lacking from the previous studies. The samples considered in this chapter come from two locations: (a) the Sandy Lake synform and the Lac Jonquet shear zone in the Lac Opocopa area (Indares 1995) and (b) the Lac Gull thrust slice in the southern Lac Audréa area (Schwarz 1998) (Figure 1.2). Finally a comparison will be made between these rocks and the metapelite of the SW Gagnon terrane which were discussed in the previous chapters.

8.1 LAC OPOCOPA AREA (INDARES 1995)

The Lac Opocopa area consists of two broad NNW-trending synformal structures, the Sandy Lake synform and the Lac Carheil synform (Figure 8.1) which are separated by the Lac Jonquet shear zone (Indares 1995). Pelitic rocks in both synforms contain leucosome, although those of the Sandy Lake synform are far less abundant and the rocks contain muscovite while lacking K-feldspar (zone 6). In contrast, pelitic rocks in the Lac Carheil synform lack muscovite and contain K-feldspar and kyanite (zone 7) with the muscovite-out isograd being located along the north and west limbs of the Lac Carheil synform (Indares 1995). As noted previously, partial melting in zone 6 is interpreted to have occurred by fluid-present reactions, whereas in zone 7 it is consistent with dehydration melting of micas. Samples appropriate for a detailed study are only available from the Sandy Lake synform and Lac Jonquet shear zone (zone 6).

Samples 240 and 70 are from the Sandy Lake synform while sample 9 is from the Lac Jonquet shear zone, near the muscovite-out isograd, and all were first described by Indares (1995) (Figure 8.1). These samples contain garnet, biotite, plagioclase, kyanite, and quartz with only sample 70 containing muscovite and having the composition of an Fe-rich pelite ($X_{Mg} = 0.36$) (Table 2.2 - Appendix 2). Samples 240 and 9 have a composition very similar to that of sample 11E (thrust slice #2) of the SW Gagnon terrane with lower K and higher Na than typical pelites and $X_{Mg} > 0.40$.

8.1.1 Mineralogy and Textures

All samples contain subidioblastic garnet porphyroblasts up to 3500 μm in diameter (Plates 8.1, 8.2, 8.3, 8.4 and 8.5). Some porphyroblasts consist of an inclusion-rich core (quartz, ± biotite) surrounded by an inclusion free rim (Plate 8.1 and 8.2). Porphyroblasts from sample 9, on the other hand, have inclusions concentrated in the core and an additional outer ring of inclusions near the rim (Plate 8.4). Garnet is rimmed and locally corroded by biotite, quartz and plagioclase (sample 9) while being separated from kyanite in sample 9 by quartz and biotite (Plate 8.4 and 8.5). The matrix of these samples consists of abundant plagioclase and quartz and subordinate biotite (Plate 8.6, 8.7 and 8.8) up to 3000- 4000 μm in length. Biotite locally rims garnet and kyanite. Kyanite is up to 3500 μm in length (<1000 μm for sample 240) and contains quartz and rutile inclusions. Muscovite laths, up to 1000 μm in length, appear primary and are only present in sample 70 (Plate 8.9).

Interpretation

Even though these samples have a similar composition to sample 11E of thrust slice #2 from the SW Gagnon terrane, they lack K-feldspar. On this basis, it is interpreted that they did not undergo dehydration melting of micas, and that some other melting reactions are responsible for the presence of leucosome. It is speculated that this area underwent fluid-present melting by the univariant reaction: Ms + Ab + Qtz + H_2O = Ky + L (Figures 2.5 and 8.13, reaction [3]) followed by the divariant reaction: Bt + Ky + Qtz + Pl = Grt + Ms which occurs on the low temperature side of reaction [R1] (Figure

8.13). These reactions will only occur, however, if muscovite was initially present in the sample with the former reaction proceeding up until the elimination of H_2O. The presence of primary muscovite in sample 70, some of which may be left over from reaction [3] while more was produced by the divariant reaction, and its absence in samples 9 and 240 could then be explained by the differences in K content of these samples, with sample 70 being the most K-rich. In this context, if only a small amount of muscovite was originally present in samples 9 and 240 it may have been entirely consumed by reaction [3].

Operation of reaction [3] is also consistent with the lack of K-feldspar in the matrix since the K released by the breakdown of muscovite is expected to dissolve in the melt rather than form any solid K-feldspar (Spear et al. 1999). The biotite, quartz and plagioclase corroding garnet may then be attributed to operation of the divariant vapour-absent reaction in the reverse sense during cooling and decompression.

8.1.2 Mineral Composition

8.1.2.1 Garnet

Analyzed garnet from all three samples show an outwards bell-shaped decrease in Sps (Figures 8.2 and 8.6c), X_{Fe} and Alm (Figures 8.2 and 8.5b), with the exception of sample 9 which only shows a slight outwards decrease in Alm (Figure 8.2b), followed by increases towards the rims for all profiles except for Sps in samples 240 and 70 (Figure 8.2a). Prp, on the other hand, shows a bell-shaped increase followed by decreases at the rims (Figures 8.2, and 8.5c). The domain of Alm\Prp rim zoning is considerably wider in sample 9 (Figure 8.2b) than in samples 240 and 70 (Figure 8.2a). The Grs zoning across garnet from the Sandy Lake synform (samples 240 and 70; Figures 8.2a, 8.3a, 8.4a, 8.5a) shows an outwards increase (Table 8.1), followed by a subsequent decrease towards the rims, whereas sample 9 from the Lac Jonquet shear zone shows a bell-shaped outwards decrease (Figures 8.2b, 8.6a). Zoning patterns in samples 240 and 9 (Figure 8.5 and 8.6) are generally concentric while those of sample 70 show patchy zoning (Figure 8.3 and 8.4).

Trace element transects reveal that with the exception of Garnet I of sample 240 (Figure 8.9) all grains show an outwards decrease in Sc, with the Sc profile from sample 9 displaying a bell-shaped decrease (Figures 8.11 and 8.12), and a slight increase or flattening of the profiles at the rims (Figures 8.7, 8.8, 8.10, 8.11, 8.12). Samples 9 and 240 show a broad outwards decrease in P (Figures 8.9, 8.10, 8.11 and 8.12) while sample 70 (Figures 8.7 and 8.8) shows peaks which may be correlated with the Grs peaks. The trace element profiles of sample 70 (Figures 8.7 and 8.8) are difficult to interpret, however, due to the presence of numerous inclusions in the garnet which caused significant spiking of counts. Y also displays a significant outwards decrease which is narrower than the P decreases, whereas Ti experiences only a slight decrease towards the rims of the A-B traverses across Garnets I and II from sample 240 (Figures 8.9 and 8.10). Cr is essentially flat across garnets from sample 240 (Figures 8.9 and 8.10) except for slight decreases at some rims while Garnet II of sample 9 (Figure 8.12) and the garnet from sample 70 (Figures 8.7 and 8.8) show a more pronounced decrease from peaks which may be associated with inclusions.

Interpretation

The outwards bell-shaped decrease in Sps (Figures 8.2 and 8.6c), X_{Fe}, Alm (Figures 8.2 and 8.5b), Y (Figures 8.9, 8.10, 8.12) and Sc (Figures 8.11, 8.12) and the bell-shaped increase in Prp (Figure 8.2) indicate that growth zoning is preserved in the core of the garnet while the increase in X_{Fe} towards the rims of all garnets indicates that biotite and garnet have undergone retrograde Fe-Mg exchange with decreasing temperatures. The wider rim domains of sample 9, however, indicate that the degree of retrogression is varied. The increase in Sps towards the garnet rims in sample 9 indicates that some grains have also been resorbed (Figure 8.2b). The rim areas enriched in Grs in garnet porphyroblasts from Samples 240 and 70 (Figures 8.2a, 8.3a, 8.4a) are consistent with growth in the presence of An-enriched plagioclase, owing to dissolution of Ab in the melt following the univariant reaction: Ms + Qtz + Ab + H_2O = Ky + L (Figure 8.13, reaction [3]). Garnet growth would then have occurred by the divariant fluid-absent reaction: Bt + Ky + Qtz + Pl = Grt + Ms (Figure 8.13), if muscovite was present in the sample (sample 70), or by other alternative reactions in the muscovite-free samples.

This link between Grs zoning of samples 240 and 70 and partial melting processes is presented for the first time within the context of this study. Initially the Grs zoning was simply interpreted as growth zoning by Indares (1995).

8.1.2.2 Biotite and plagioclase

Biotite (X_{Mg} = 0.55-0.69, Table 8.2) and plagioclase (An = 11-27 %, Table 8.3) are chemically homogeneous with the exception of increased X_{Mg} in biotite and X_{An} in plagioclase towards some rims adjacent to garnet (Indares 1995). The uniform composition of the biotite implies pervasive Fe-Mg diffusion while the homogeneity of the plagioclase suggests that the grains were recrystallized during peak conditions (Indares 1995). The increase in X_{An} towards some plagioclase rims is consistent with the post-peak transfer of Ca from garnet to plagioclase during retrogression.

8.1.3 Summary and *P-T* Constraints

8.1.3.1 Summary

Samples 240, 70 and 9 from metamorphic zone 6 in the Lac Opocopa area (Figures 1.2 and 8.1) differ from all the other studied samples in that they do not display evidence of dehydration melting of micas. Instead, they appear to have undergone limited melting at pressures above the sillimanite-kyanite transition by the fluid-present melting reaction: Ms + Qtz + Ab + H_2O = Ky + L (Figure 8.13) followed by garnet growth by a divariant vapour-absent reaction of the type: Bt + Ky + Pl + Qtz = Grt + Ms (Figure 8.13). The following features are consistent with this metamorphic history:

(1) Mineral assemblage

The presence of primary muscovite (in sample 70) and kyanite and the absence of K-feldspar indicates that the *P-T* conditions for reaction [R1] were not reached and that another melting reaction was responsible for the presence of leucosome. Some of the muscovite initially present in sample 70, and possibly all of the muscovite in samples 240 and 9, may have melted by reaction [3]: Ms + Qtz + H_2O = Ky + L with some of the muscovite present in sample 70 also being formed during the prograde operation of the reaction: Bt + Ky + Pl + Qtz = Grt + Ms.

(2) Garnet zoning

Grs-enriched areas near the rims of garnet porphyroblasts are consistent with initial subsolidus growth of the cores followed by growth by the vapour-absent reaction: Bt + Ky + Pl + Qtz = Grt + Ms in the presence of plagioclase that was enriched in An as a result of preferential dissolution of Ab in the melt during reaction [3] . This interpretation indicates that the presence of Grs-enriched rims in garnet are not exclusive of dehydration melting of micas as has been assumed previously (Spear et al. 1999; Indares and Dunning 2001).

8.1.3.2 Further *P-T* constraints

Since these samples have not undergone dehydration melting of micas the *P-T* conditions for samples 240, 70 and 9 calculated by Indares (1995) using the GASP thermobarometer and the Bt-Grt thermomoter are still considered valid and are summarized below. Maximum temperature and corresponding pressure conditions were calculated using the average plagioclase core compositions, average matrix biotite compositions and the lowest X_{Fe} of garnet at the outer limit of the growth zoning. These maximum conditions range from 1180-1300 MPa and 720-740°C for sample 9, 1600 MPa and 800-840°C for sample 240 and 1450 MPa and 830°C for sample 70. When plotted on a *P-T* diagram for the NaKFMASH system, the maximum temperature of sample 9 is slightly lower than that required for reaction [R1] to occur, which is consistent with the lack of evidence for dehydration melting of micas in this area. The maximum temperature conditions for samples 240 and 70, on the other hand, plot in the field of biotite dehydration melting which is not in accord with the interpretation deduced from the textural and compositional data. This discrepancy may be due to the presence of An in the plagioclase because the location of reaction [R1] in the CaNaKFMASH system would be displaced at higher temperatures in proportion to the amount of Ca in the system.

8.2 LAC AUDRÉA AREA (SCHWARZ 1998)

Although true pelitic rocks are sparse in the area studied by Schwarz (1998), they have been identified along with much more abundant quartzofeldspathic rocks in four thrust sheets: the Gueslis, Lac Don, Lac Gull and Lac Lamêlée thrust sheets (Figure 8.14). Leucosomes are confined to quartzofeldspathic rocks in the two northernmost thrust slices (Gueslis and Lac Don) whereas further south (Lac Gull and Lac Lamêlée thrust sheets) leucosomes occur in pelitic rocks (zone 7). Pelitic rocks of zone 7 contain the assemblage garnet + biotite ± plagioclase + quartz + K-feldspar ± kyanite with local retrograde muscovite replacing kyanite. The presence of K-feldspar and kyanite in this assemblage indicates that *P-T* conditions for the reaction Ms + Ab + Qtz = Ky + Kfs + L ([R1], or alternatively [R1a]: Phe + Ab + Qtz = Bt + Ky + Kfs + L) were exceeded and that these rocks reached the *P-T* field of the continuous biotite dehydration melting reaction Bt + Qtz + Ky + Ab = Kfs + Grt + L ([R2], Figures 2.6 and 2.7), while the replacement of kyanite by retrograde muscovite is consistent with operation of reaction [R1] from right to left during melt crystallization.

Among the rocks studied by Schwarz (1998), sample S-218 from the Menihek Formation (Lac Gull thrust sheet) is the only one to contain the full assemblage (see above) and large garnets (>6000 μm), so it was selected for a detailed re-examination. S-218 has been described as a pelitic schist (Schwarz 1998); however it is more Al and Fe-Mg rich than the samples from the SW Gagnon terrane implying a slightly more restitic character. This sample also displays a higher X_{Mg} ($X_{Mg} = 0.54$, Table 2.2 - Appendix 2) relative to samples studied in the SW Gagnon terrane (0.31-0.48; Tables 2.1 - Appendix 2).

8.2.1 Mineralogy and Textures

Sample S-218 consists predominantly of biotite, porphyroblastic garnet and kyanite, subordinate quartz and plagioclase and minor K-feldspar. Garnet porphyroblasts are up to 8000 μm in diameter and contain numerous inclusions of quartz, biotite and rutile that define a straight internal fabric (Plate 8.10). Although garnet is subidioblastic-idioblastic, it is rimmed and variably embayed by biotite, kyanite and quartz. Kyanite mainly occurs as large corroded porphyroblasts up to 3000 μm in length, which contain numerous aligned inclusions of quartz (Plate 8.11), and also as smaller grains. Biotite mainly occurs as fine-grained aggregates that crosscut rare biotite porphyroblasts embayed by quartz (Plate 8.12). Quartz occurs in the matrix with kyanite and biotite

(Plate 8.12) and also in pods with plagioclase and perthitic K-feldspar (Plate 8.13). These pods also contain biotite but are not associated with kyanite. Minor tourmaline is also present in the matrix (Plate 8.12) and as randomly oriented inclusions in garnet.

Interpretation

The presence of K-feldspar and kyanite indicates that reaction [R1] has been exceeded and metamorphic conditions have reached the *P-T* field of biotite dehydration melting by reaction [R2] in the kyanite field. In this context, the biotite-bearing, K-feldspar and quartz -rich pods (Plate 8.13) are interpreted as leucosome. Kyanite porphyroblasts were likely produced, in part at least, by subsolidus reactions followed by growth during dehydration melting of white mica (reaction [R1] or [R1a]) and were subsequently partially resorbed by reaction [R2] that consumes kyanite. However, the presence of corroded biotite porphyroblasts (Plate 8.12) suggests that dehydration melting of biotite (reaction [R2]) did not proceed to completion. The abundance of biotite and kyanite suggests that plagioclase, rather than these phases, was the limiting phase in reaction [R2]. It may also be possible that the maximum temperature reached was insufficient for compete melting. Even though reaction [R2] did not proceed to completion, the fine-grained biotite, kyanite and quartz that rim and variably embay garnet (Plate 8.10) likely formed by the retrograde operation of reaction [R2] in the reverse sense.

8.2.2 Mineral Compositions

8.2.2.1 Garnet

The garnet porphyroblast from sample S-218 (Plate 8.10, Table 8.4) shows strong, concentric chemical zoning in the core characterized by an outwards increase in Prp (16→40%, Figures 8.15b and 8.16) and decrease in Alm (71→54%, Figures 8.15c and 8.16), X_{Fe} (81→57%, Figure 8.16), Sps (2→1%, Figure 8.16) and Grs (11→9-6%, Figures 8.15a and 8.16). The Grs decrease, however, is interrupted by two sets of concentric peaks, which has not been seen in any other sample from this study. Towards rim A, the first peak is followed by a decrease, a second peak, another decrease and finally a zone of constant Grs. Rim B, on the other hand, appears to be truncated shortly after the second Grs peak and shows a final sharp decrease at the outermost rim. The rims also display a slight decrease in Prp and increase in X_{Alm} and X_{Fe}. This zoning reversal follows a zone of relatively flat gradients in one side of the grain (rim A, Figure 8.16).

The trace element profiles show a bell shaped Sc decrease outwards followed by a slight increase at rim B (Figure 8.17a). The Ti profile along traverse A-B show peaks which correspond spatially to the first set of Grs peaks (Figure 8.16) adjacent to the core. These peaks are not apparent, however, along traverse C-D (Figure 8.17b) in which the profiles show only concentric decreases towards the rims. Y and P also show a broad outwards decrease followed by a slight increase in P at rims A, B (Figure 8.17a) and D (Figure 8.17b) and Y at rims A and B (Figure 8.17a).

Interpretation

The outward decrease in X_{Fe} in the core (Figure 8.16) is consistent with prograde growth of subsolidus garnet with increasing temperature, whereas the bell-shaped decrease in Sc (Figure 8.17) reflects the compatible behavior of this trace element in the garnet structure (Yang and Rivers 2002). The preservation of the former trend indicates inefficient diffusional homogenization of garnet even in terms of fast diffusing elements such as Fe and Mg. Growth zoning in the subsolidus core is also supported by the outwards bell-shaped decrease in Sps and Grs (Figure 8.16). The Grs profile, however, displays two sets of concentric Grs peaks which has not been seen so far in this study. Since the appropriate assemblage (presence of kyanite and K-feldspar and lack of prograde muscovite) occurs in this sample, one of these sets is interpreted to be the result of garnet growth in the presence of melt during dehydration melting of biotite by reaction [R2]. In this context, it is important to recall that the present study of the Lac Opocopa area indicates that Grs peaks can also form during the operation of a vapor-absent reaction: Bt + Ky + Pl + Qtz = Grt + Ms following vapor-present melting by the reaction: Ms + Qtz + H_2O = Ky + L below the *P-T* conditions for dehydration melting of biotite. It is therefore possible that the first set of concentric peaks outwards from the subsolidus core may have formed following vapour-present melting and that the second set may have formed during dehydration melting of biotite. The final decrease in Grs at rim B may then be linked to retrograde Grs consumption by the GASP reaction. The increase in X_{Fe} at rim B (Figure 8.16b) is due to retrograde Fe-Mg exchange between garnet and biotite with decreasing temperature but the relatively flat gradients near rim A are not well understood.

8.2.2.2 Biotite and plagioclase

X_{Fe} of biotite from this sample ranges from 0.26-0.28 (Table 8.5) and is much lower than the X_{Fe} of analyzed biotite from the SW Gagnon terrane (X_{Fe} =0.29-0.58). Biotite is essentially homogeneous with no compositional variation occurring with microtextural setting (Schwarz 1998). Plagioclase has an An content of 10-19% (Table 8.6) overlapping with the An contents of plagioclase from slice #2, which is consistent with crystallization from the melt during cooling. Individual grains display a slight increase in An towards the rims which is consistent with An production after Grs during decompression.

8.2.3 Summary and *P-T* constraints

8.2.3.1 Summary

Sample S-218, from the Lac Gull thrust slice (Figure 8.14) in the eastern Gagnon terrane (Figure 1.2), displays a number of features consistent with dehydration melting of micas above the sillimanite-kyanite transition.

The absence of primary muscovite and the presence of K-feldspar and kyanite indicates that dehydration melting of white mica (reaction [R1] or reaction [R1a], Figures 2.6 and 2.7) has occurred and the sample has reached the *P-T* field of dehydration melting of biotite (reaction [R2], Figure 8.19a -segment A). The latter is supported by the presence of secondary peaks in the bell-shaped X_{Grs} profile. However, the presence of corroded biotite porphyroblasts suggests that reaction [R2] was not completed.

Quartz + K-feldspar ± albite pods (Plate 8.13) are interpreted as leucosome. In addition the second set of Grs (together with Ti) peaks near the rim areas of garnet porphyroblasts are consistent with growth of these rims by reaction ([R2]) while the first set are interpreted to have resulted from a divariant vapour-absent reaction: Bt + Ky + Pl + Qtz = Grt + Ms following vapor-present melting by the reaction Ms + Qtz + H_2O = Ky + L. The outermost garnet rims, on the other hand, are characterized by retrograde zoning and are variably corroded by biotite and plagioclase, which likely formed by the operation of reaction [R2] in the retrograde sense during melt crystallization (Figure 8.19a - segment B).

8.2.3.2 Further *P-T* constraints

There exists suitable evidence for dehydration melting of biotite in this area which allows the use of key X_{Fe} - garnet and GASP isopleths to further constrain the *P-T* history of sample S-218 from the Lac Gull thrust slice.

As was the case in the SW Gagnon terrane, the *P-T* conditions at which muscovite was eliminated and biotite began melting are constrained by the intersection of reaction [R1] and the GASP isopleth which involve the first garnet that grew with melt by reaction [R2]. Since the first set of concentric Grs peaks in garnet are interpreted to have formed following vapour-present melting, the second set of peaks outwards from the core were used to calculate a GASP isopleth, along with the plagioclase core with the highest An content since no subsolidus plagioclase were identified (Table 7.1 - Appendix

7). Only a single GASP isopleth was calculated since both peaks of the second concentric set have essentially the same composition. As was the case with samples from the SW Gagnon terrane, estimated pressure conditions should be viewed as maxima because plagioclase which initially participated in [R2] was likely more An-rich than the plagioclase present in the matrix, the latter being produced by melt crystallization. The conditions of melt crystallization were determined using the only garnet rim analysis that showed a retrograde increase in X_{Fe} and a plagioclase rim showing an outwards increase in X_{An}. Since no plagioclase grains were found touching or immediately adjacent to garnet, the plagioclase most closely associated with garnet was used.

Since growth zoning in garnet is well preserved in terms of Alm and Prp and because the sample has a high X_{Mg}, the X_{Fe} - garnet isopleths (see section 2.4.3.3) may be directly used to find the prograde and retrograde *P-T* conditions of crossing reaction [R1]. To determine the prograde conditions of crossing reaction [R1] the X_{Fe} -garnet isopleth corresponding to the analysis of second peak of Ca enrichment (Figure 8.16b) was used, whereas the retrograde crossing conditions were determined using the garnet rim analysis which showed a retrograde X_{Fe} increase. The maximum temperature the sample was subjected to cannot be reliably determined since the rims of the garnet have been retrogressed.

Intersection of reaction [R1] with relevant GASP isopleths indicates that biotite began melting at approximately 1525 MPa and 795°C while the retrograde conditions of melt crystallization were estimated to be 1280 MPa and 770°C. The use of the X_{Fe} isopleths of these same garnet analyses to determine the *P-T* conditions for these scenarios actually produced comparable results with the onset of melting beginning at 1420 MPa and 785°C and final melt crystallization occurring at approximately 1340 MPa and 775°C. The similarity of the results derived from both of these methods reflects the relatively high X_{Mg} of this sample and supports the notion that the use of X_{Fe} isopleths in garnet to constrain *P-T* histories is best suited for metapelites of this composition rather than those which are more iron-rich (see section 2.4.3.3).

The X_{Fe} isopleths can also be used to provide support for the interpretation of Grs zoning discussed in the previous section and in section 8.2.2.1. If the first set of Grs peaks rather than the second were thought to have been the result of reaction [R2] then the *P-T* conditions determined using the X_{Fe} isopleths would have yielded a major unexplainable discrepancy. The conditions of melting would have being estimated at 1150 MPa and 755°C which would have actually been lower than the conditions determined for crystallization at 1340 MPa and 775°C.

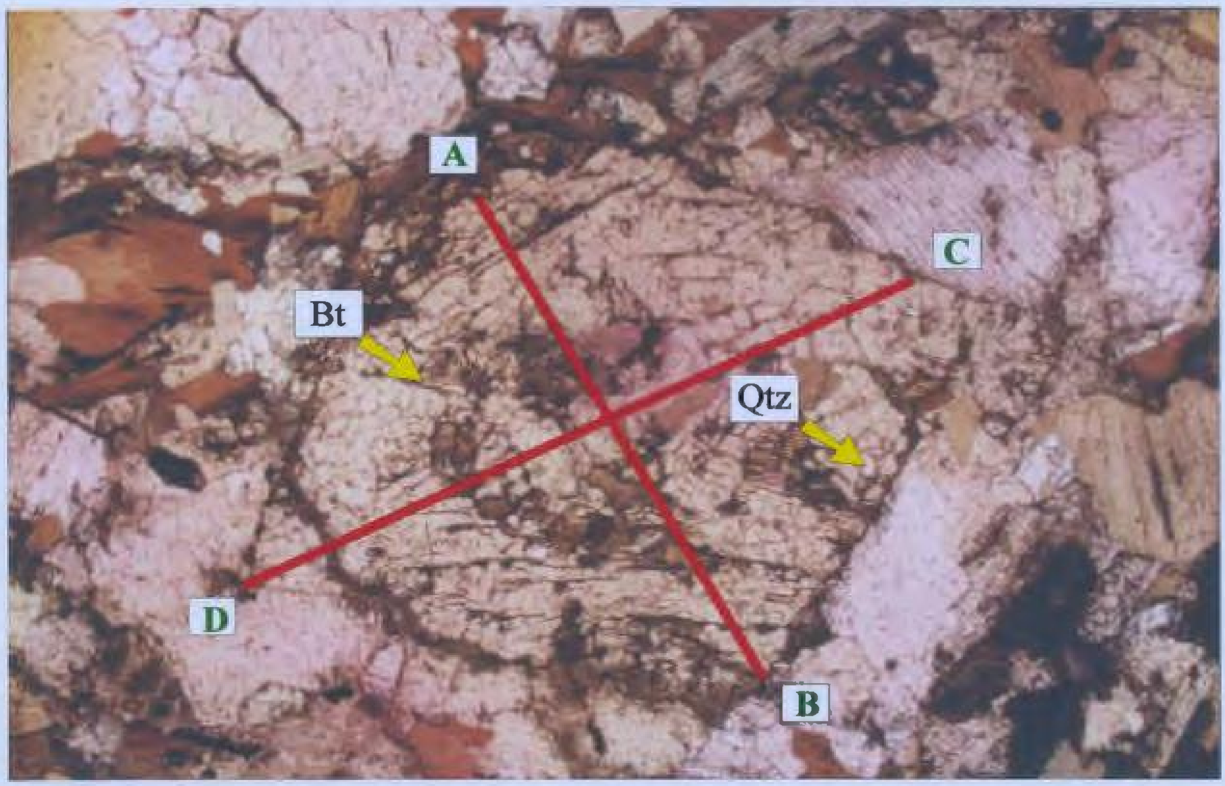


Plate 8.1: Garnet I from sample 70 with inclusions of quartz and biotite. Lines A-B and C-D indicate paths of analysis (see Figures 8.2 and 8.7).

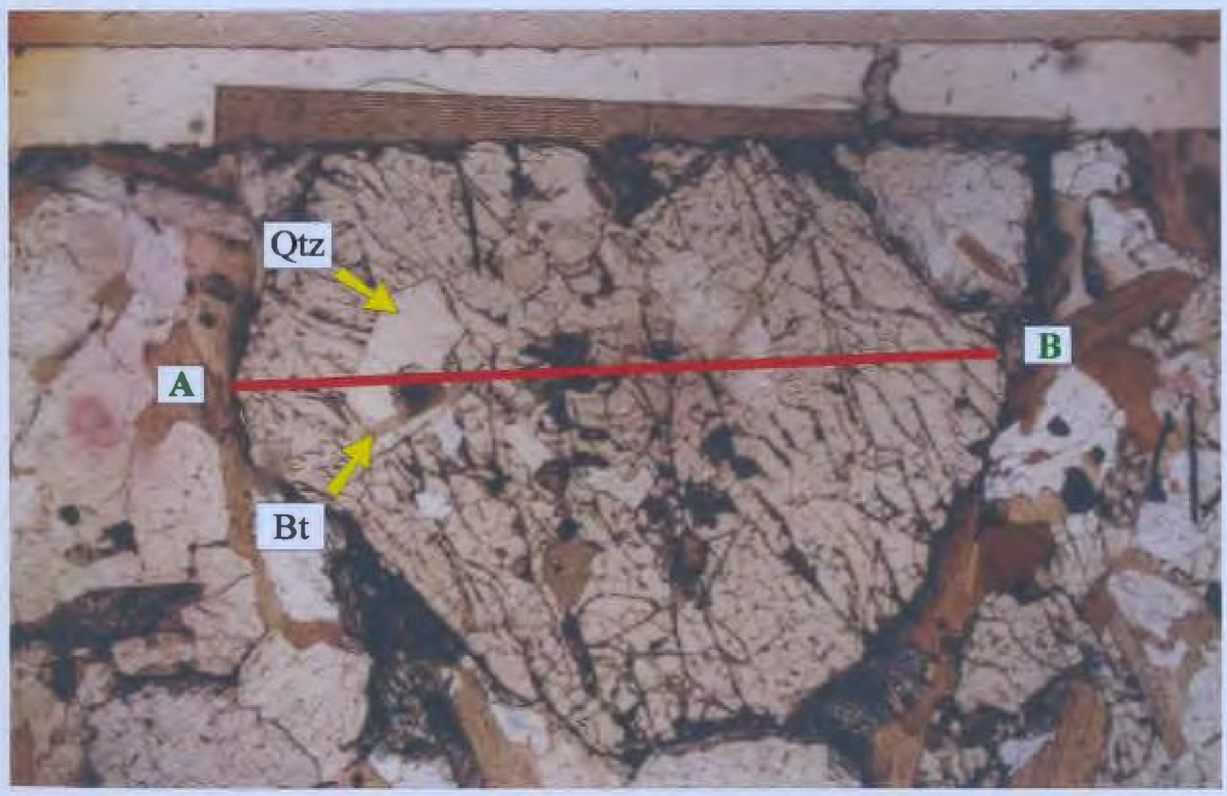


Plate 8.2: Garnet II from sample 70 with inclusions of quartz and biotite. Line A-B indicates the path of microprobe analysis (see Figure 8.8).

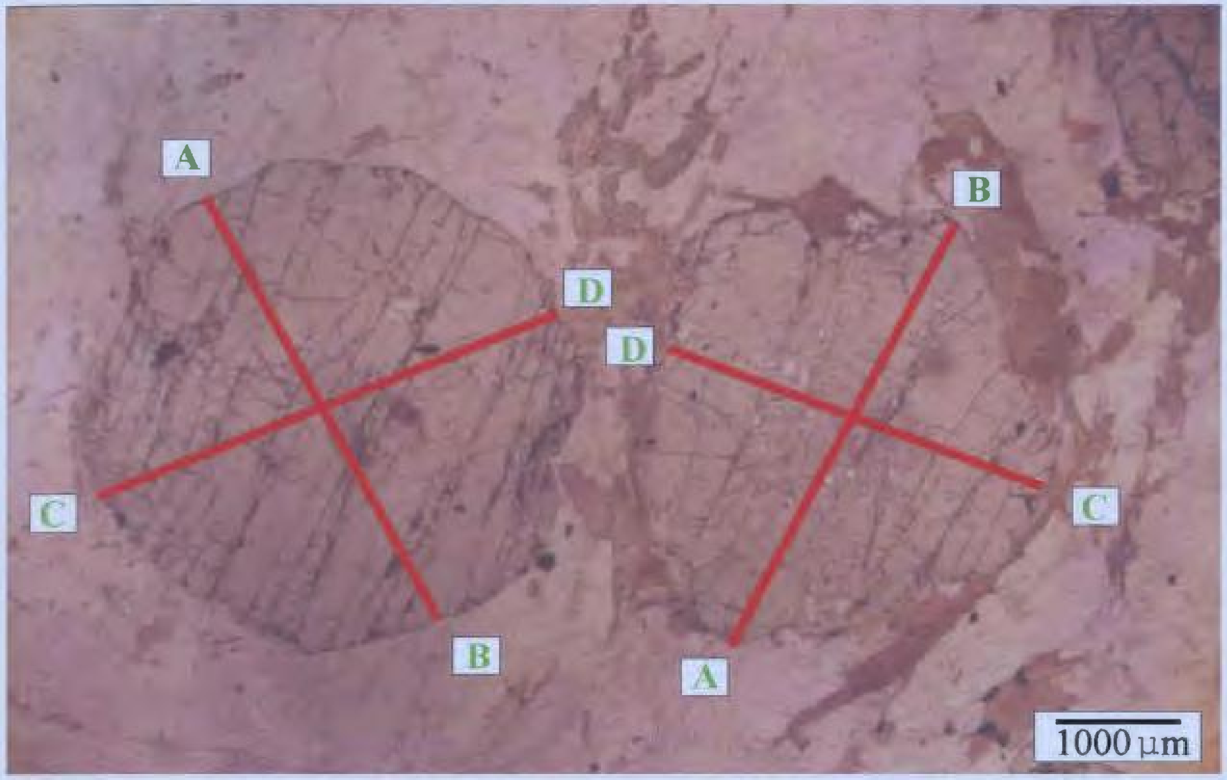


Plate 8.3: Garnet I (left) and Garnet II (right) from sample 240. Lines A-B and C-D indicate paths of microprobe analyses (see Figures 8.2, 8.9, and 8.10).

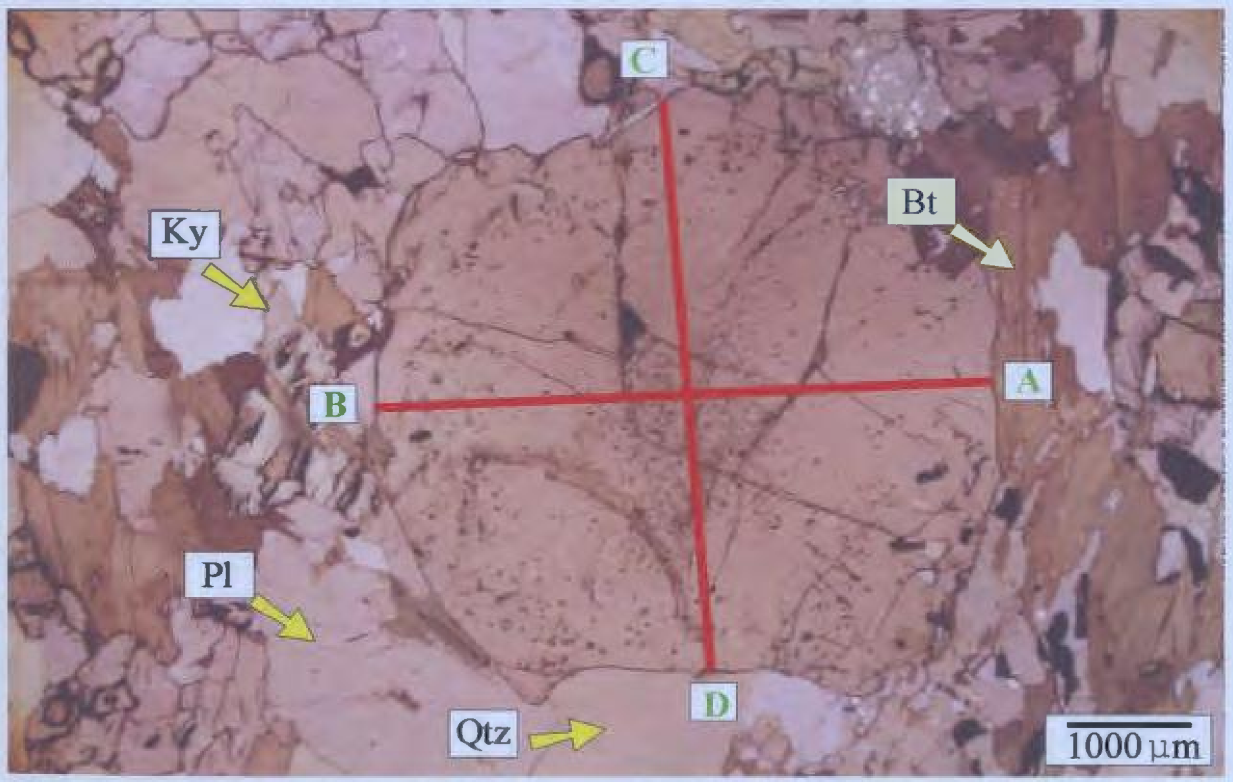


Plate 8.4: Garnet I from sample 9. Lines A-B and C-D indicate paths of microprobe analyses (see Figures 8.2 and 8.11).

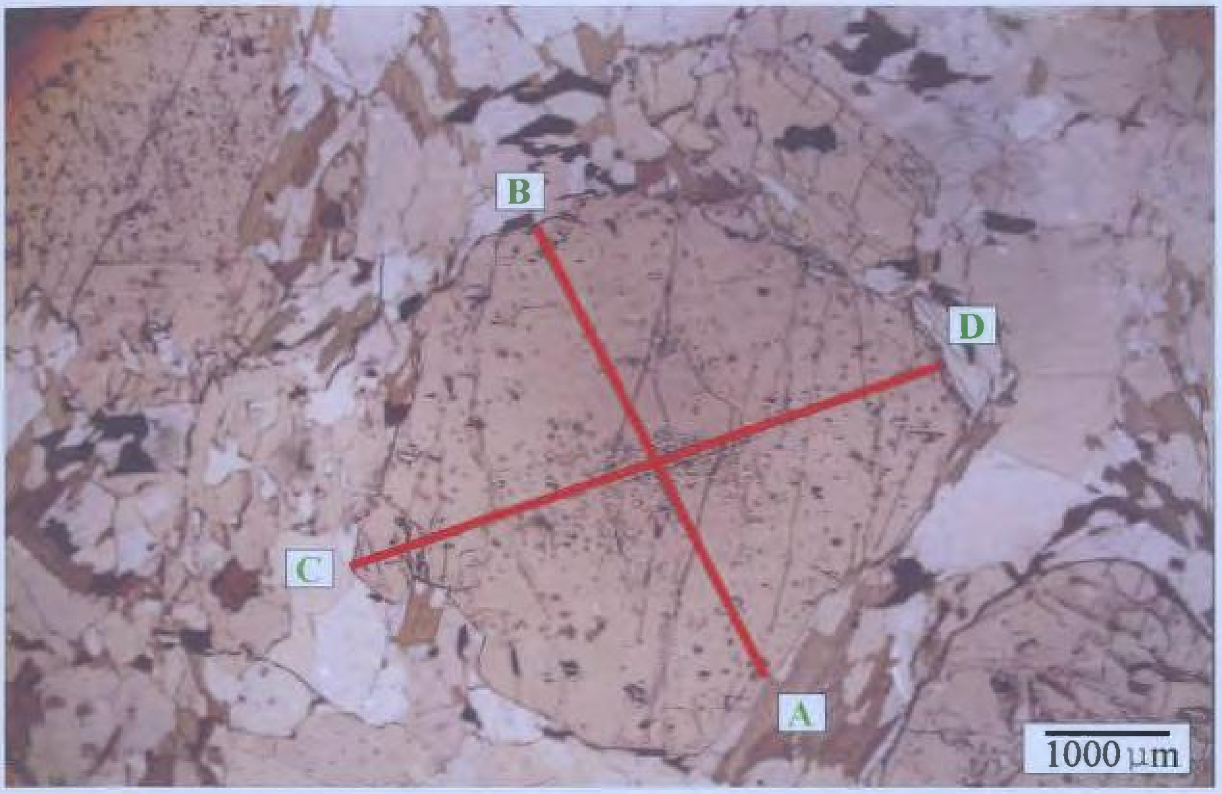


Plate 8.5: Garnet II from sample 9. Lines A-B and C-D indicate paths of microprobe analyses.

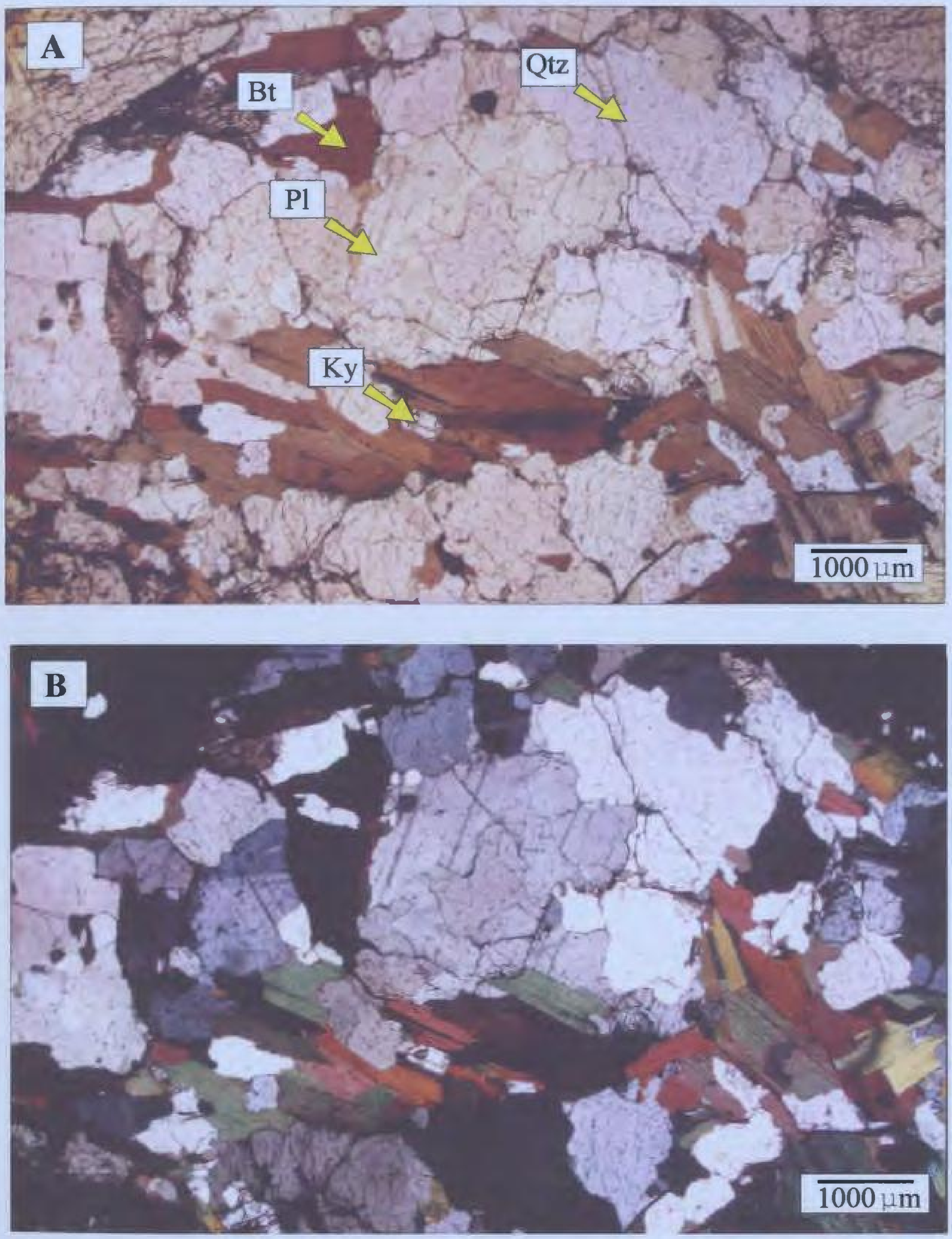


Plate 8.6: Matrix consisting of quartz, plagioclase, biotite and kyanite (sample 70). (A) plane polarized light and (B) cross polarized light.

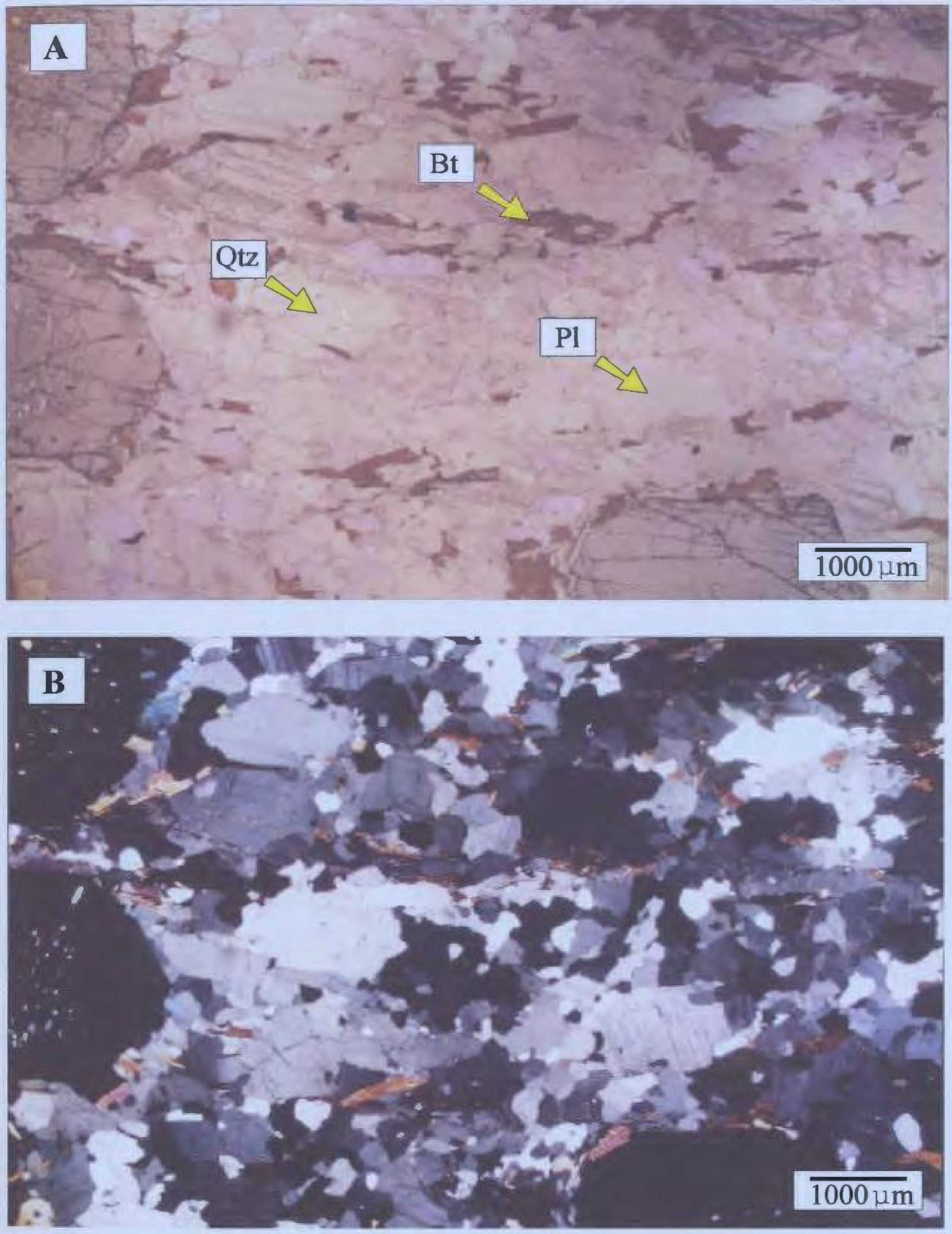


Plate 8.7: Matrix consisting of plagioclase, quartz and biotite (sample 240).
(A) plane polarized light and (B) cross polarized light.

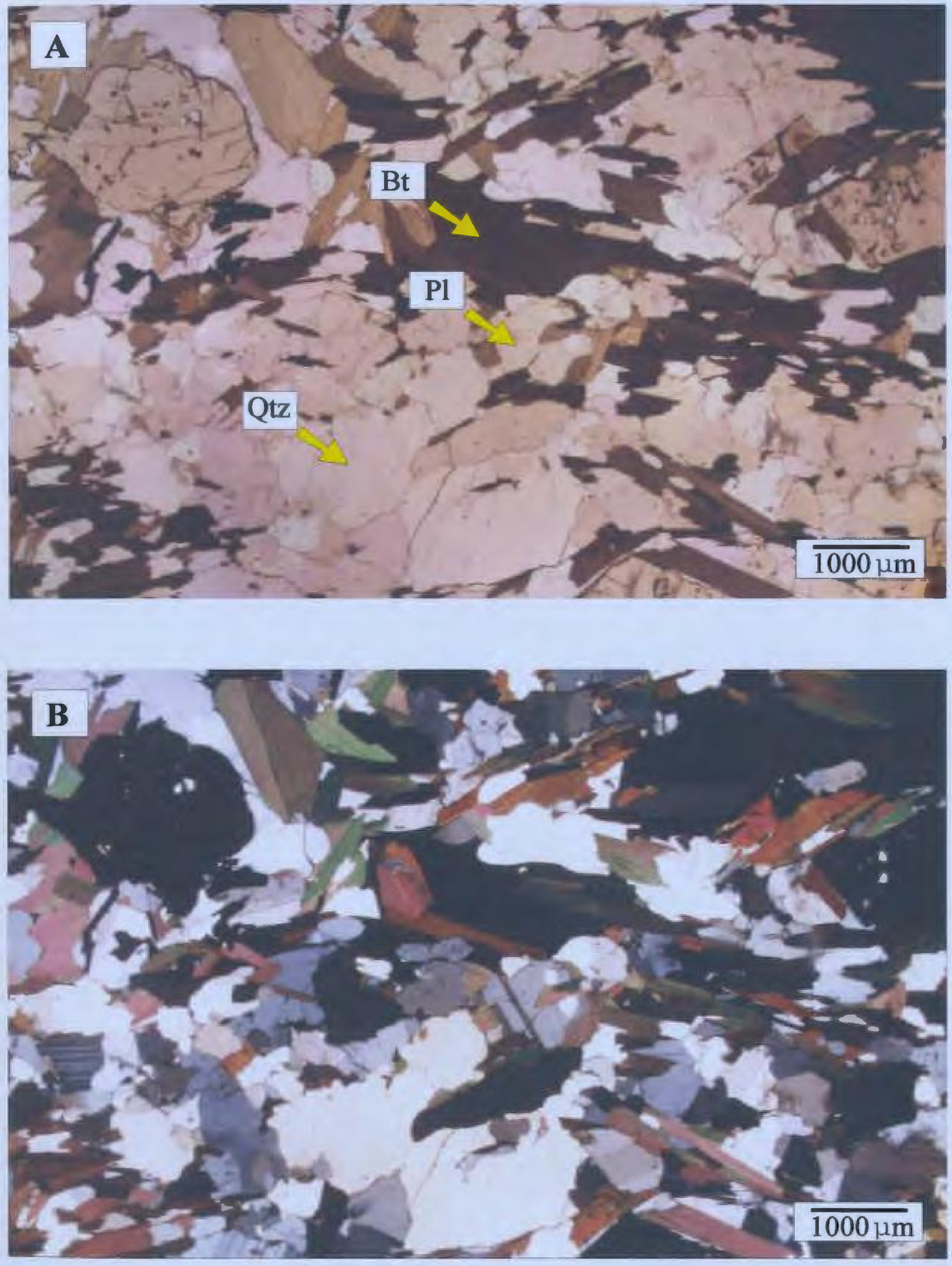


Plate 8.8: Matrix consisting of plagioclase, quartz and biotite (sample 9). (A) plane polarized light and (B) cross polarized light.

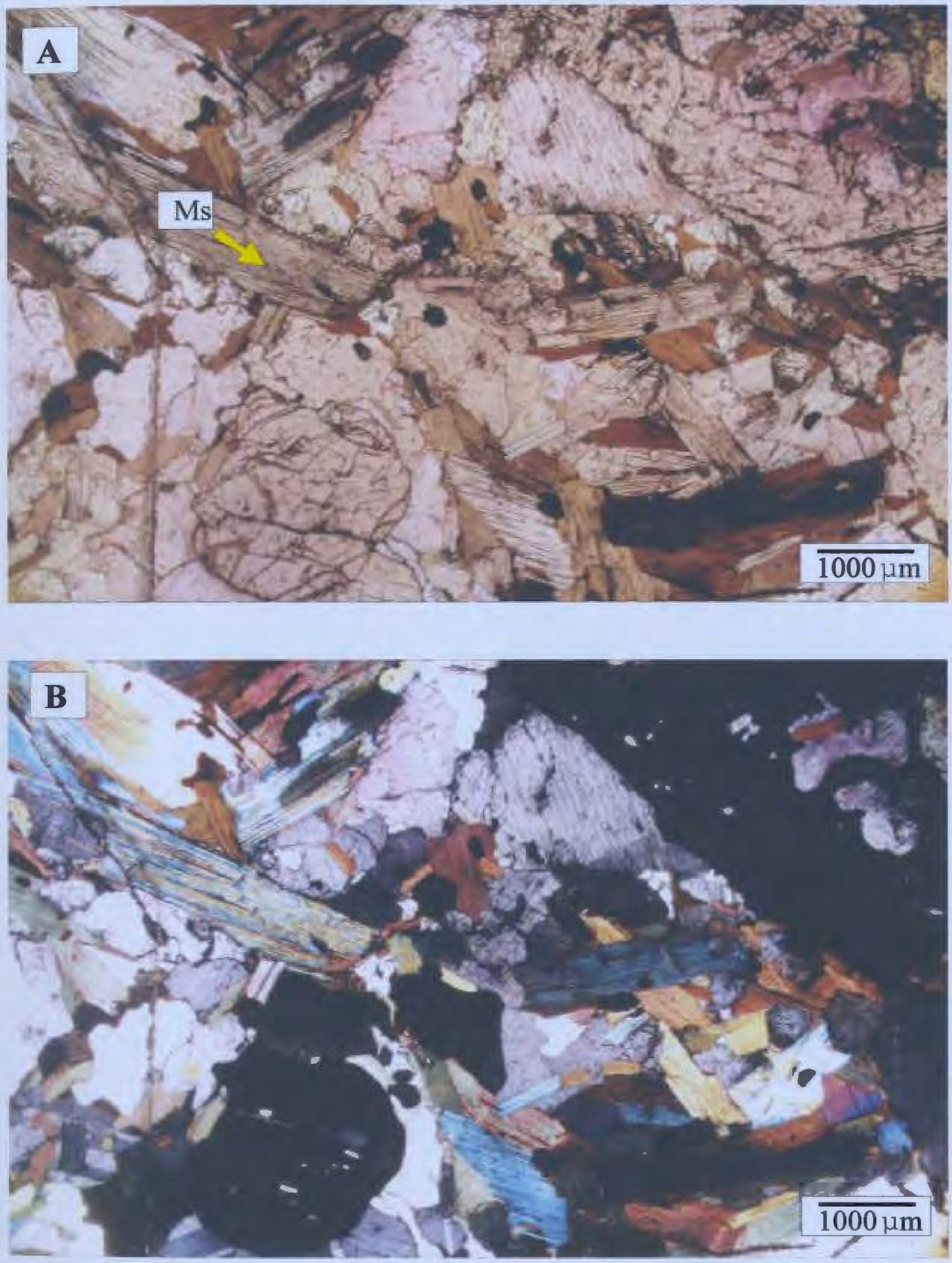


Plate 8.9: Primary muscovite (sample 70). (A) plane polarized light and (B) cross polarized light.

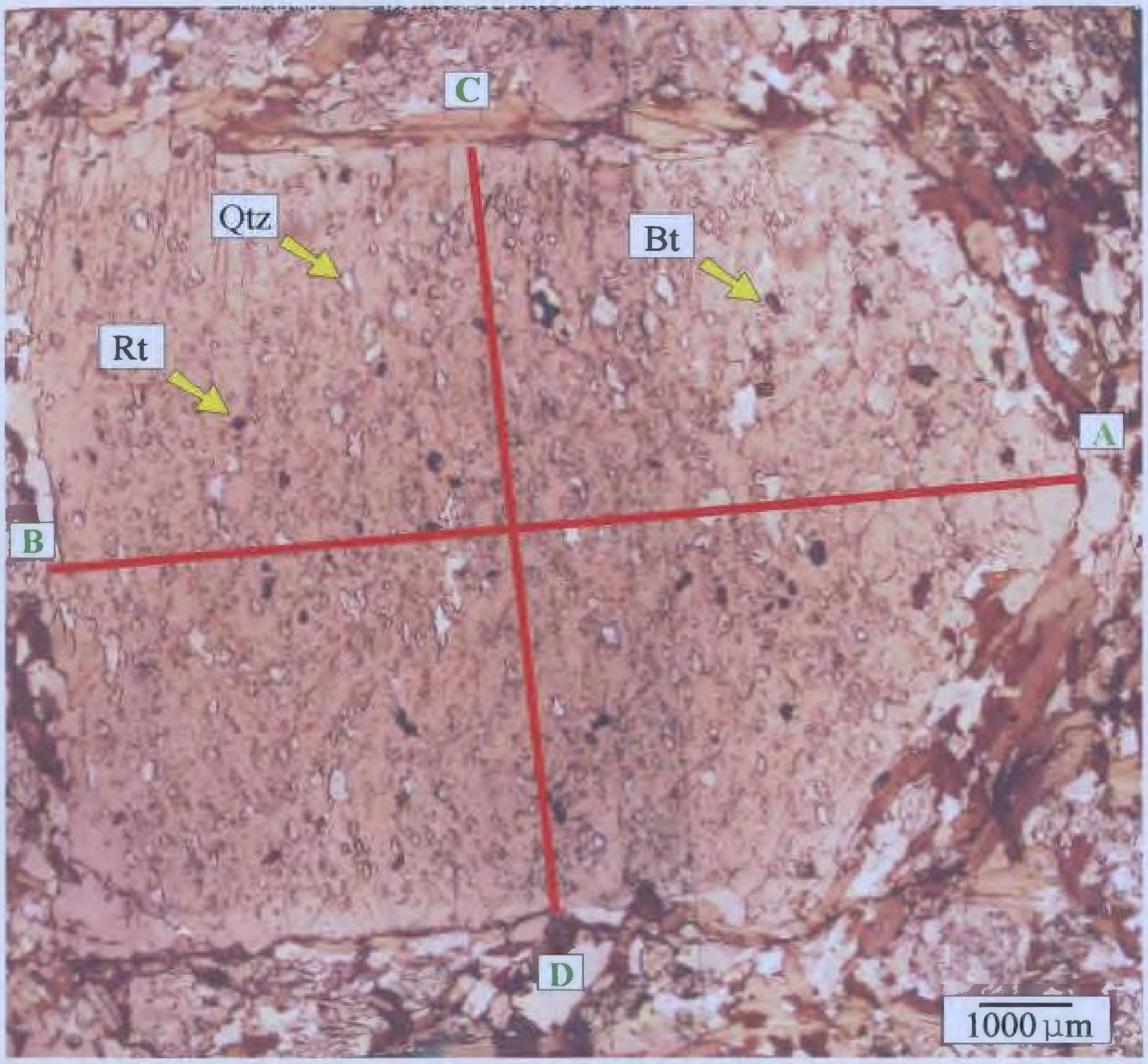
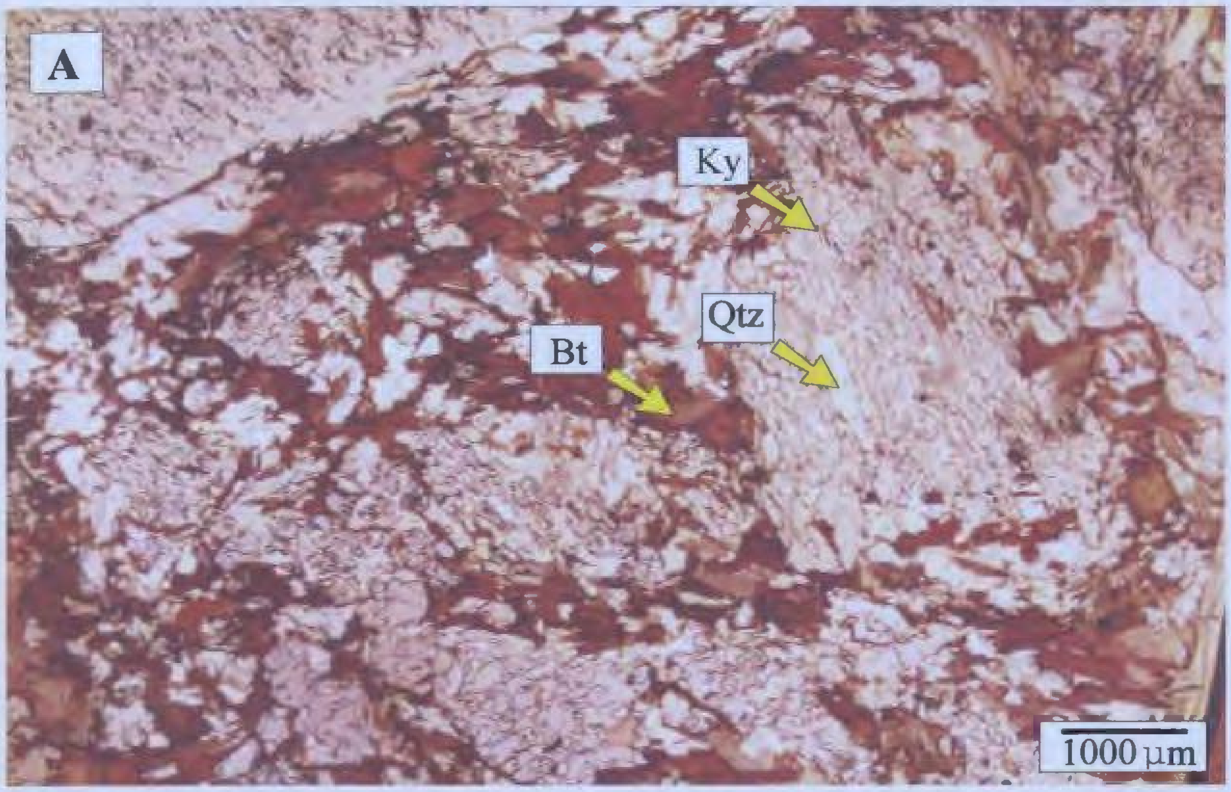


Plate 8.10: Garnet porphyroblast from sample S-218. The core is rich in inclusions of biotite, quartz and rutile. Lines A-B and C-D indicate paths of microprobe analyses (See Figures 8.16 and 8.17).



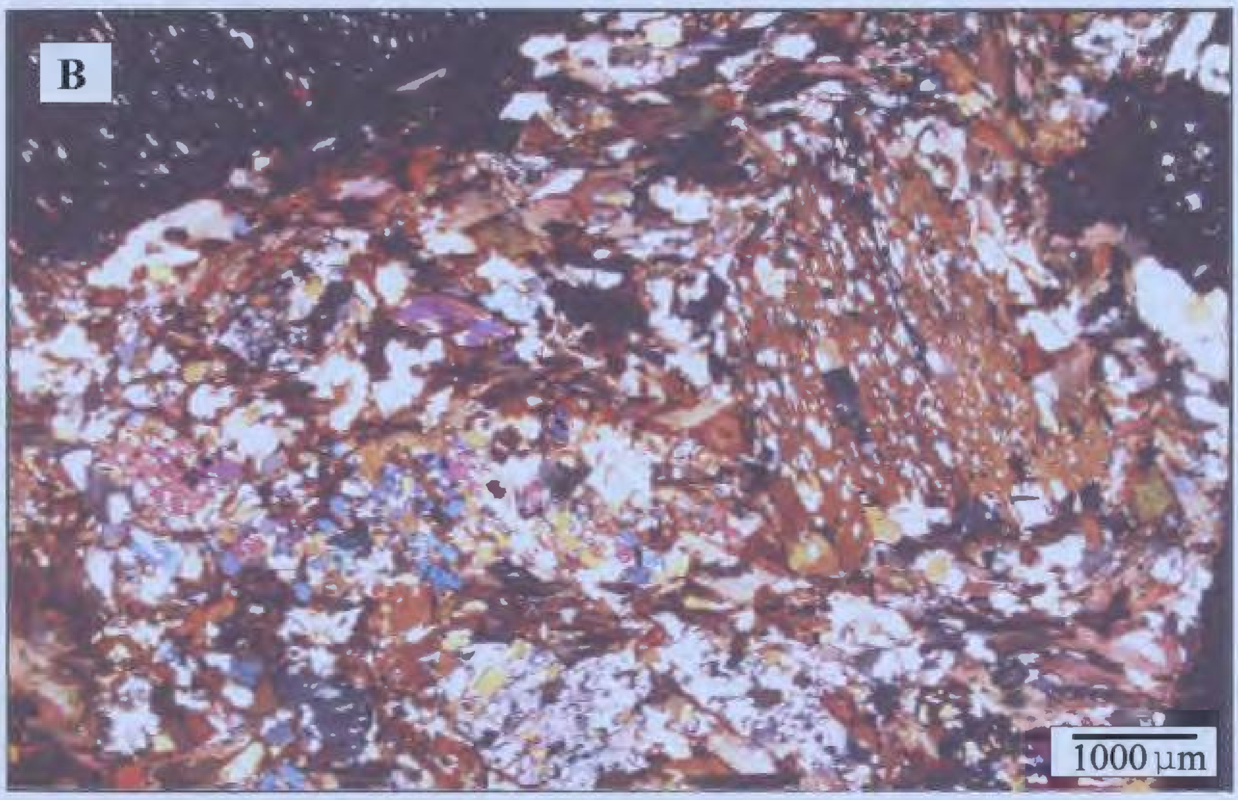


Plate 8.11: Corroded kyanite porphyroblasts which contain numerous quartz inclusions (sample S-218). (A) plane polarized light and (B) cross polarized light.

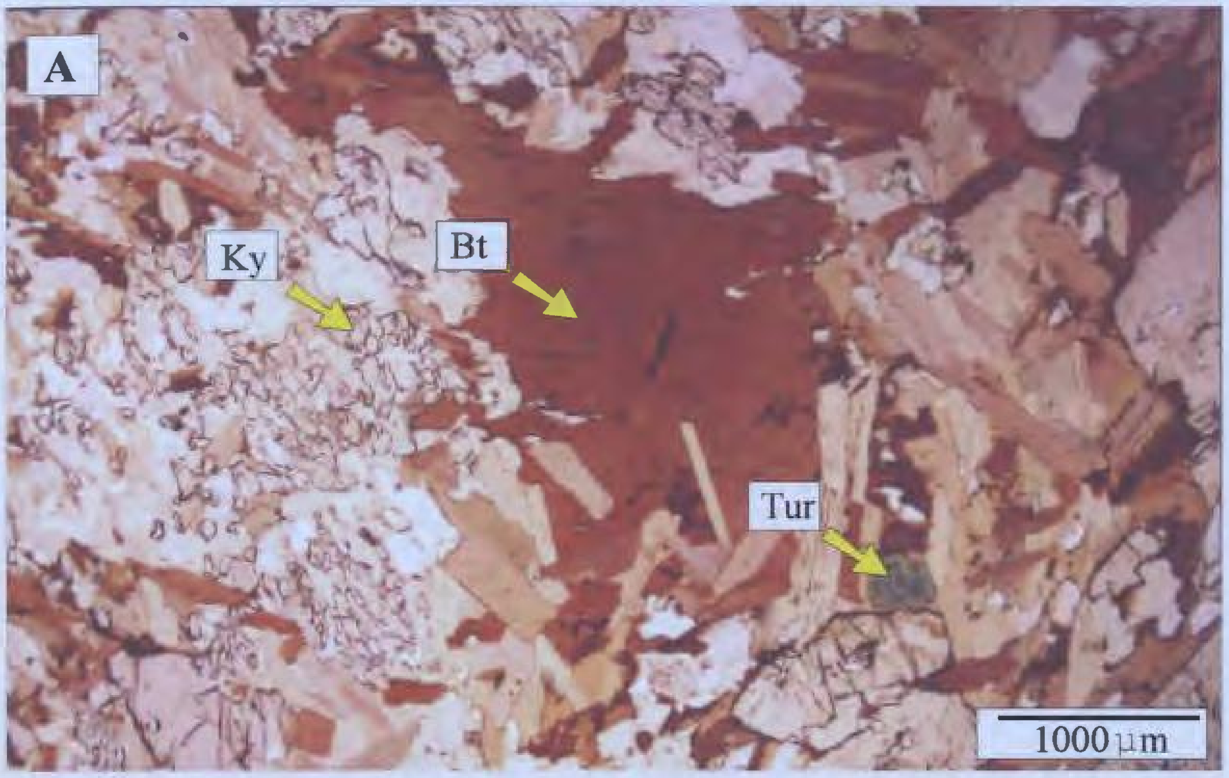


Plate 8.12: Biotite porphryoblast crosscut by smaller biotite grains (sample S-218). (A) plane polarized light and (B) cross polarized light.

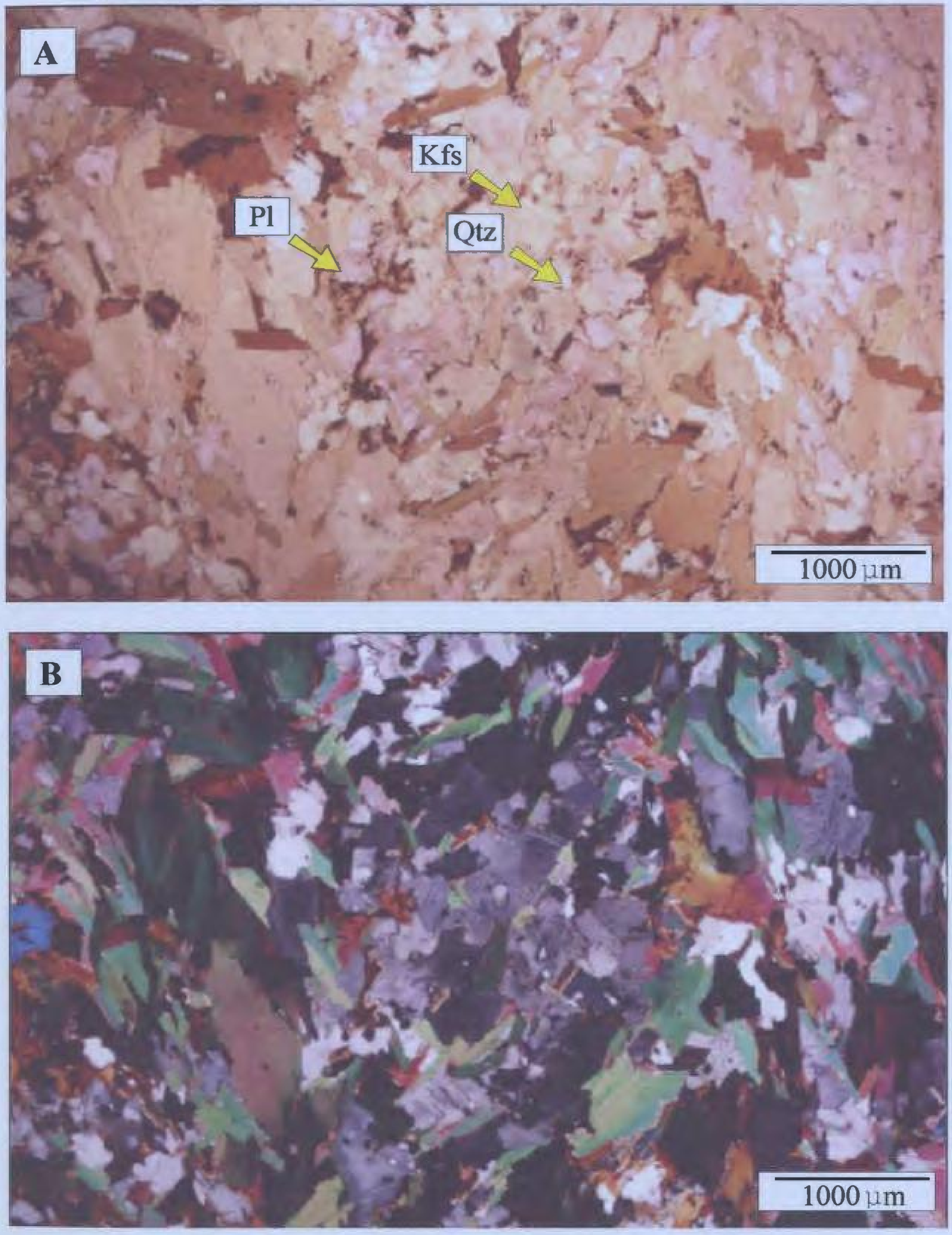


Plate 8.13: Biotite-bearing quartzofeldspathic pods interpreted as leucosome (sample S-218). (A) plane polarized light and (B) cross polarized light.

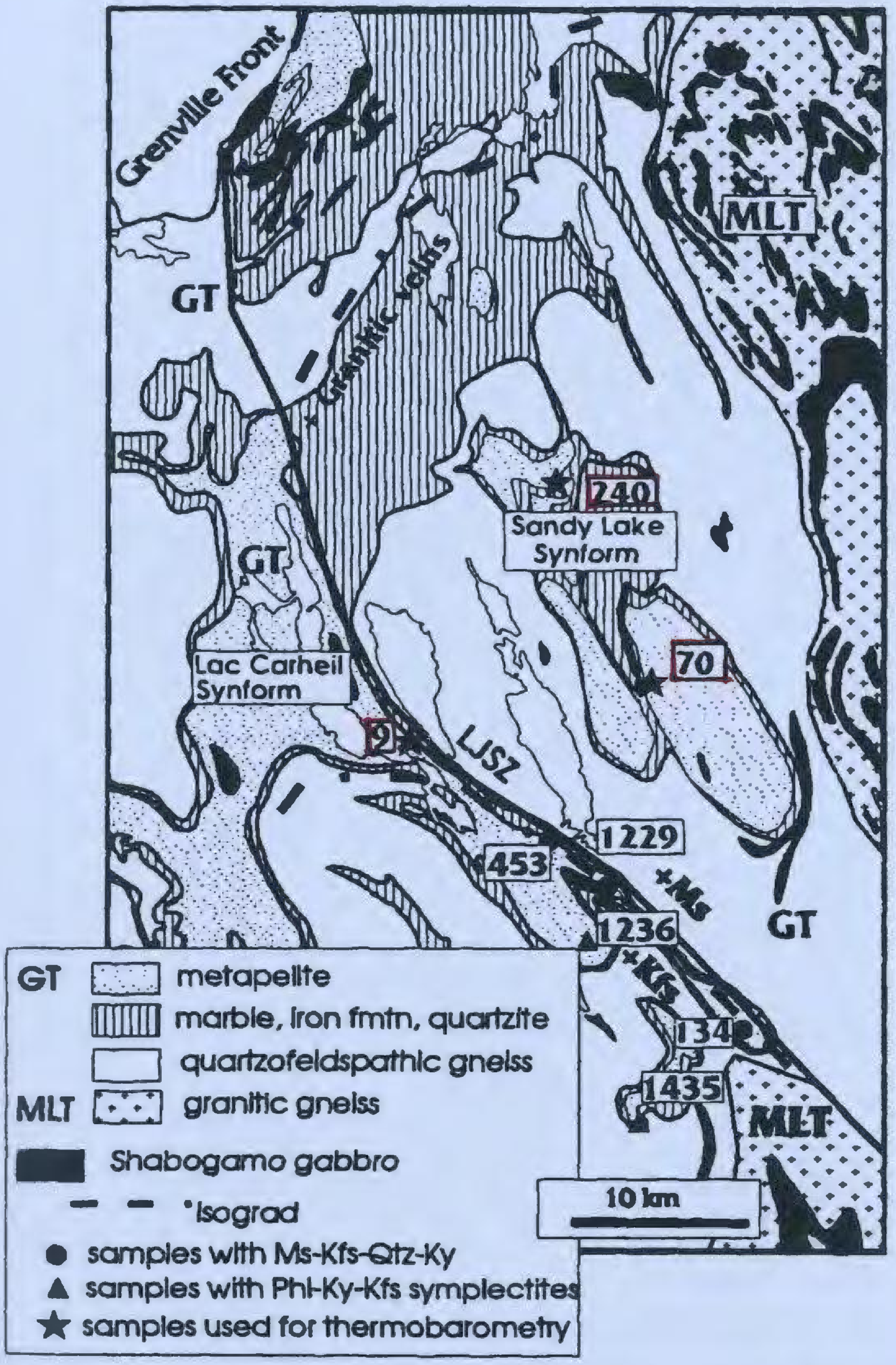


Figure 8.1: Map of sample locations studied by Indares (1995). Outlined samples 9, 70, and 240 were chosen for re-examination in the present study. Abbreviations: GT- Gagnon terrane, MLT- Molson Lake terrane, LJSZ- Lac Jonquet shear zone.

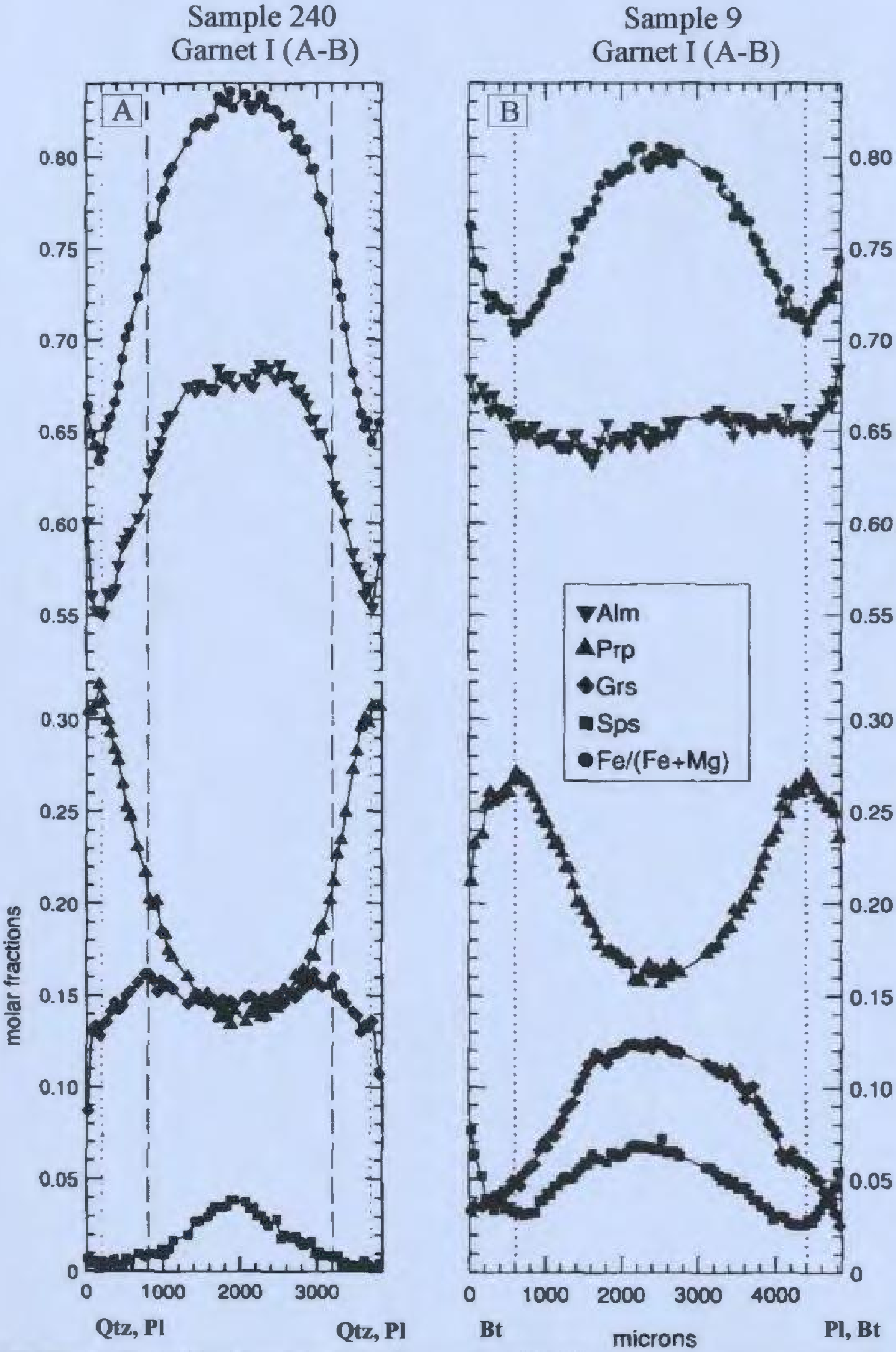


Figure 8.2: Zoning profiles of garnet from: (a) sample 240 and (b) sample 9 in terms of molar fractions of Alm, Prp, Grs and Sps from Indares (1995). Rims A and B from sample 240 are in contact with Qtz and Pl. Rims A and B from sample 9 are in contact with biotite with rim B also being in contact with Pl. Garnet profiles from sample 70 were reported to be essentially the same as those from sample 9 and were not shown by Indares (1995).

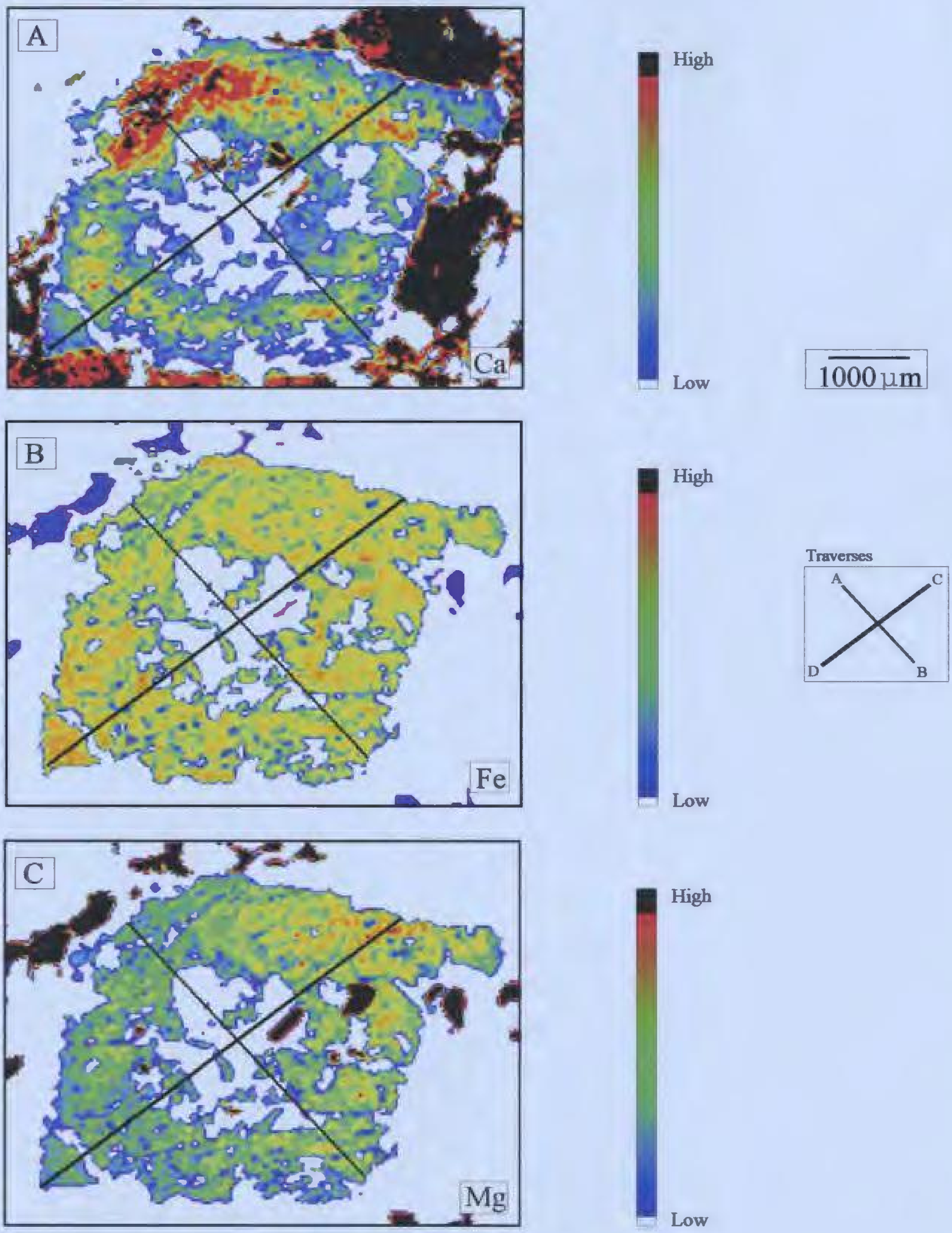


Figure 8.3: X-ray compositional maps of Garnet I from sample 70 in terms of (A) Ca, (B) Fe and (C) Mg.

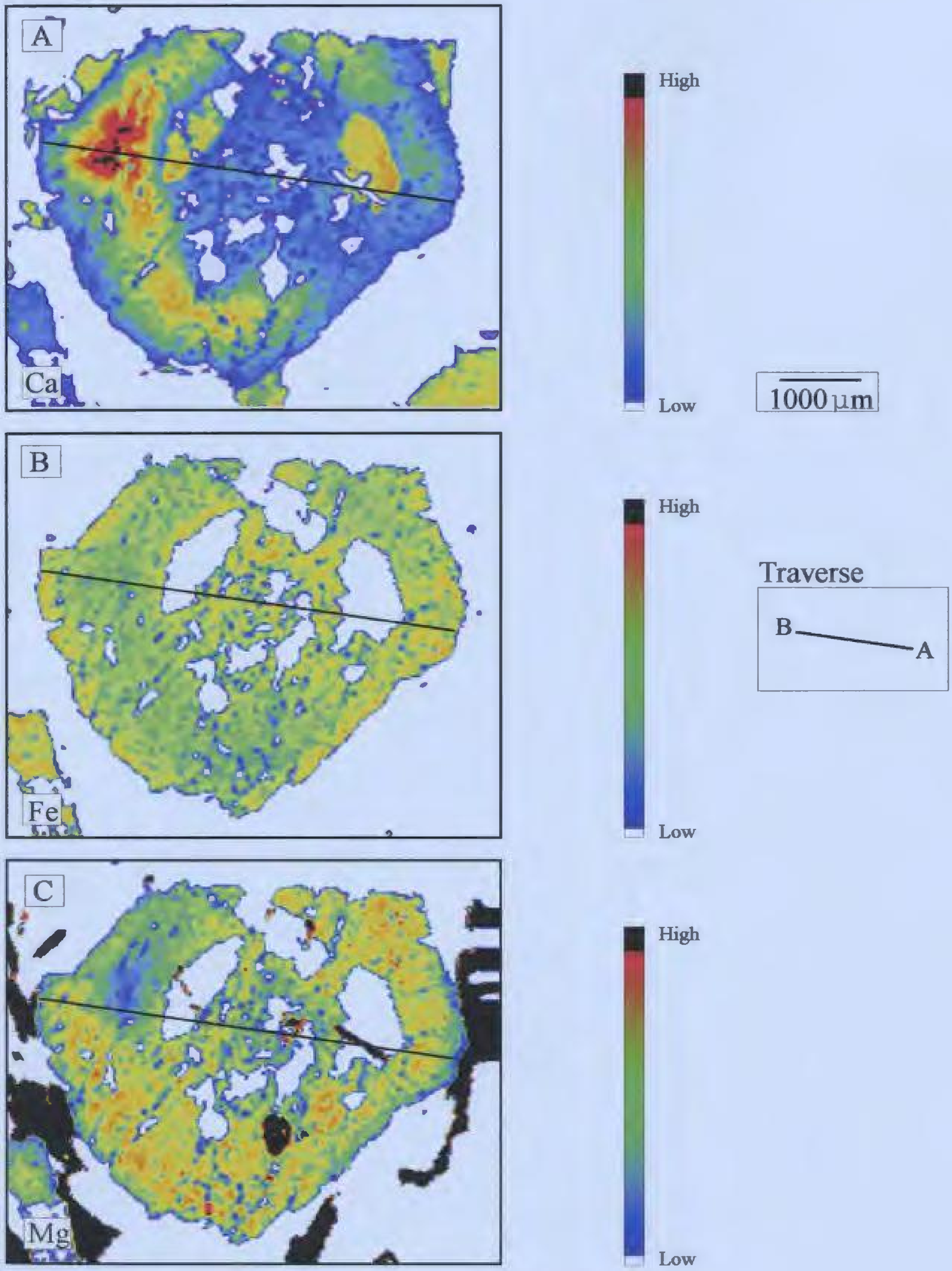


Figure 8.4: X-ray compositional maps of Garnet II from sample 70 in terms of (A) Ca, (B) Fe and (C) Mg.

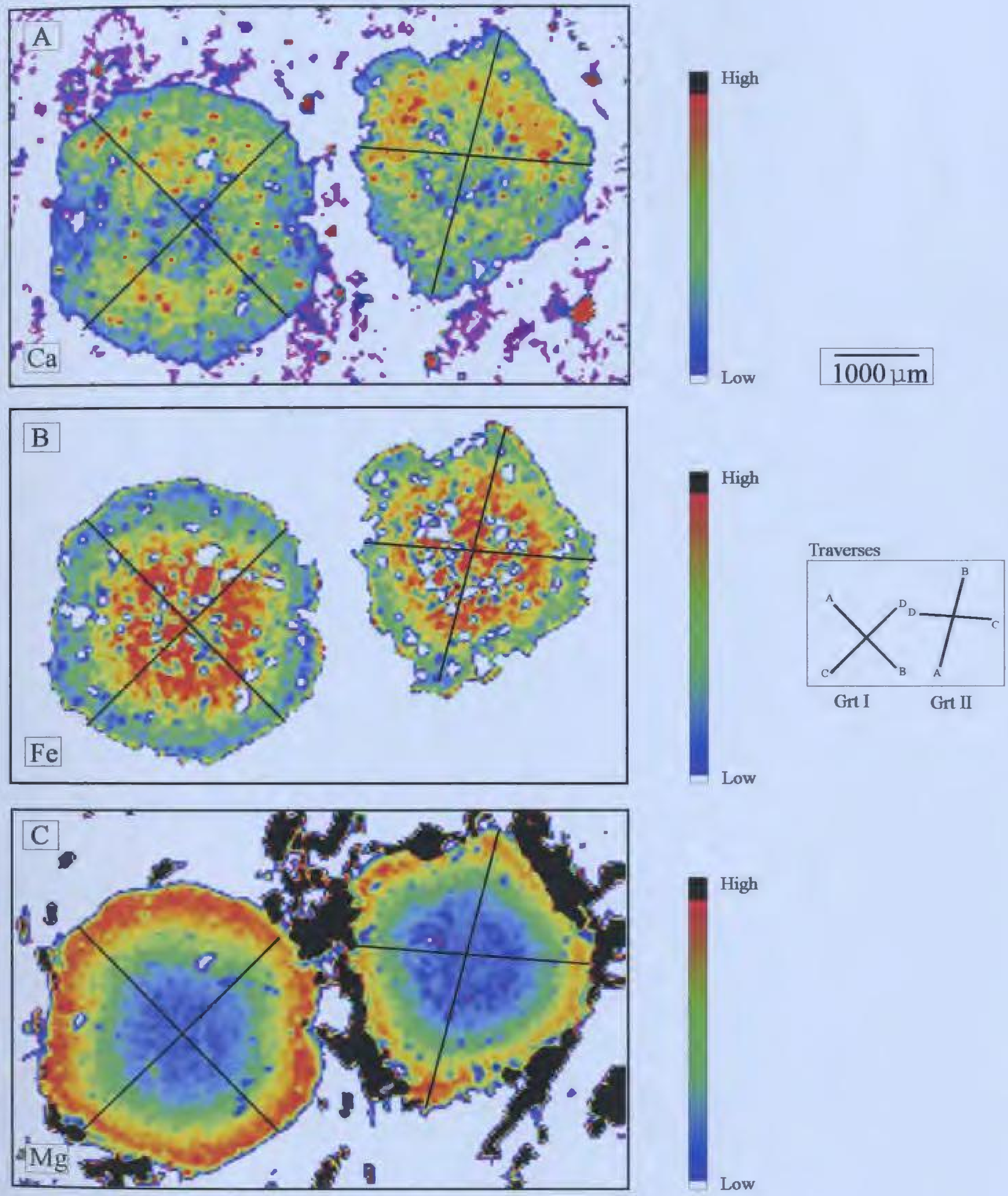


Figure 8.5: X-ray compositional maps of garnet porphyroblasts from sample 240 in terms of (A) Ca, (B) Fe and (C) Mg. Garnet I is on the right. Garnet II is on the left.

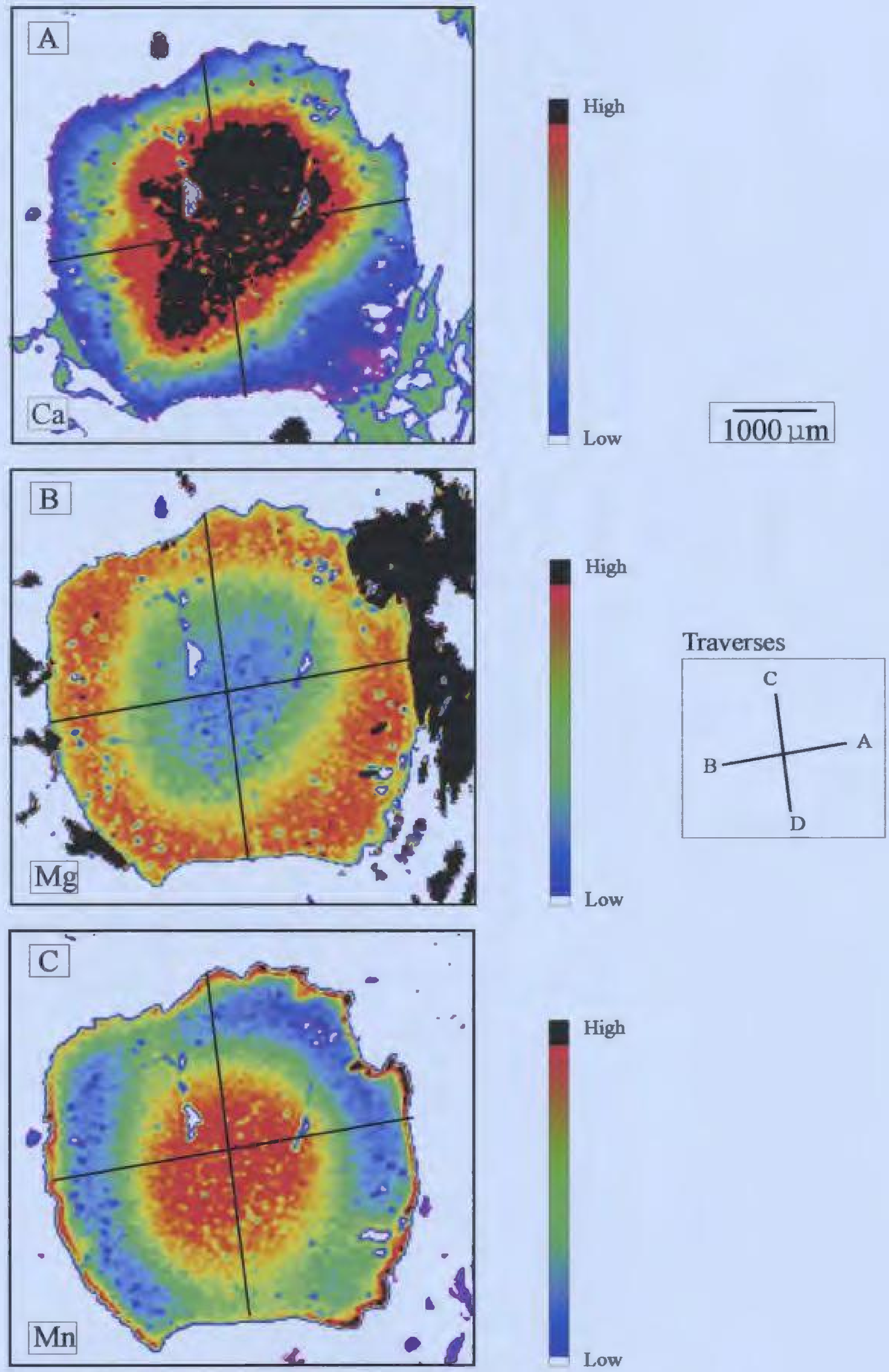


Figure 8.6: X-ray compositional maps of Garnet I from sample 9 in terms of (A) Ca, (B) Mg and (C) Mn.

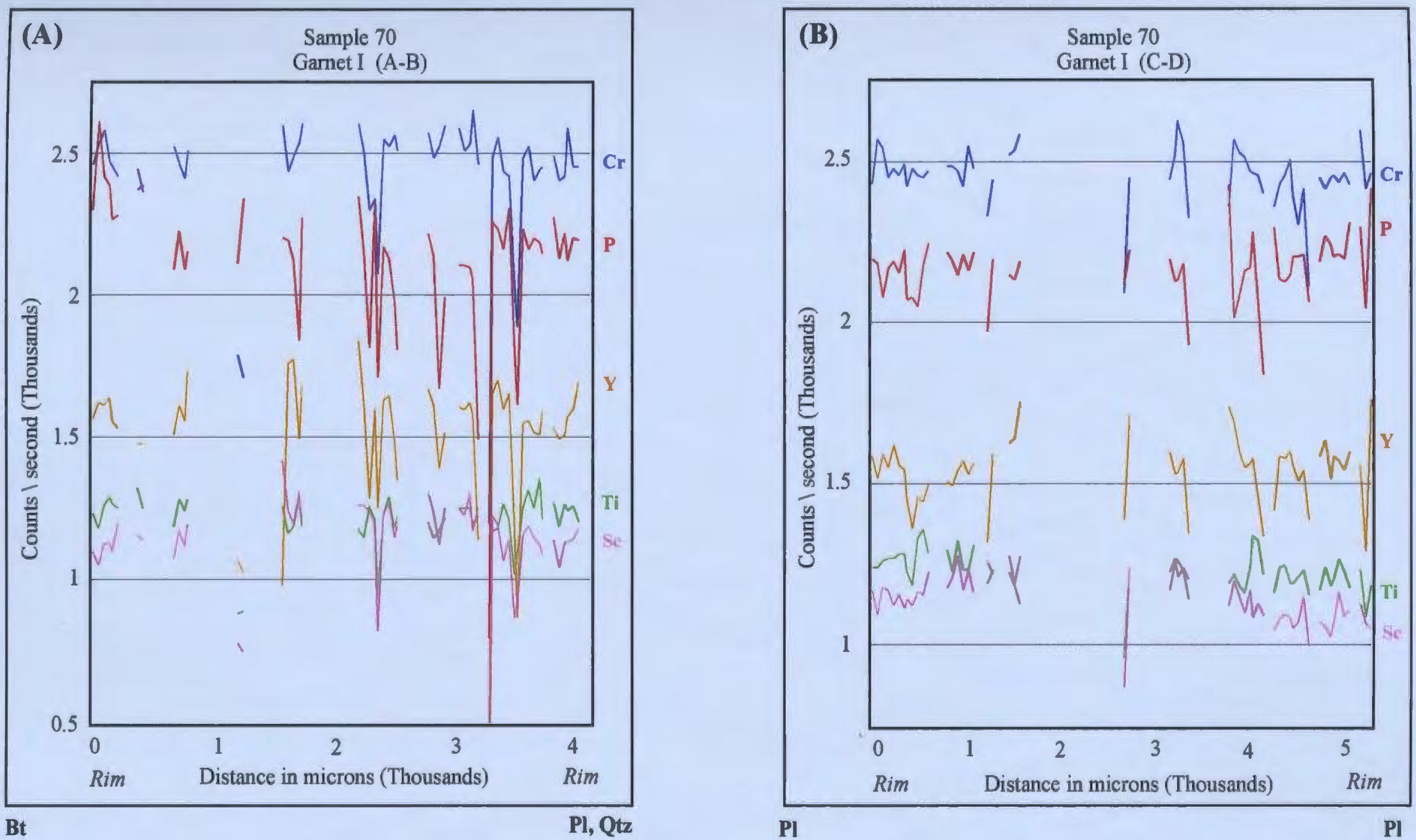


Figure 8.7: Zoning profiles of Garnet I from sample 70 in terms of counts / second of P, Ti, Sc, Y, and Cr along (A) transect A-B and (B) transect C-D. See Plate 8.1 for location of transects. Rim A is in contact with Bt; rim B with Pl and Qtz; and rims C and D with P1.

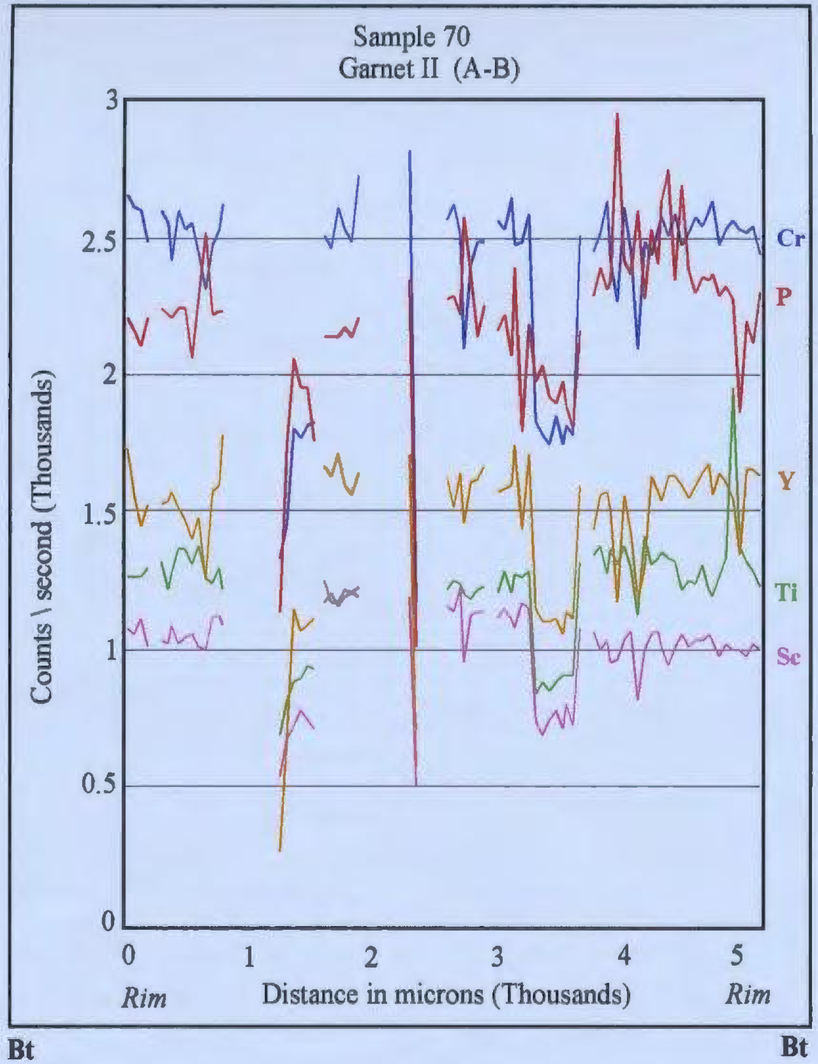


Figure 8.8: Zoning profiles of Garnet II from sample 70 in terms of counts / second of P, Ti, Sc, Y, and Cr along transect A-B. See Plate 8.2 for location of transect. Both rims are in contact with Bt.

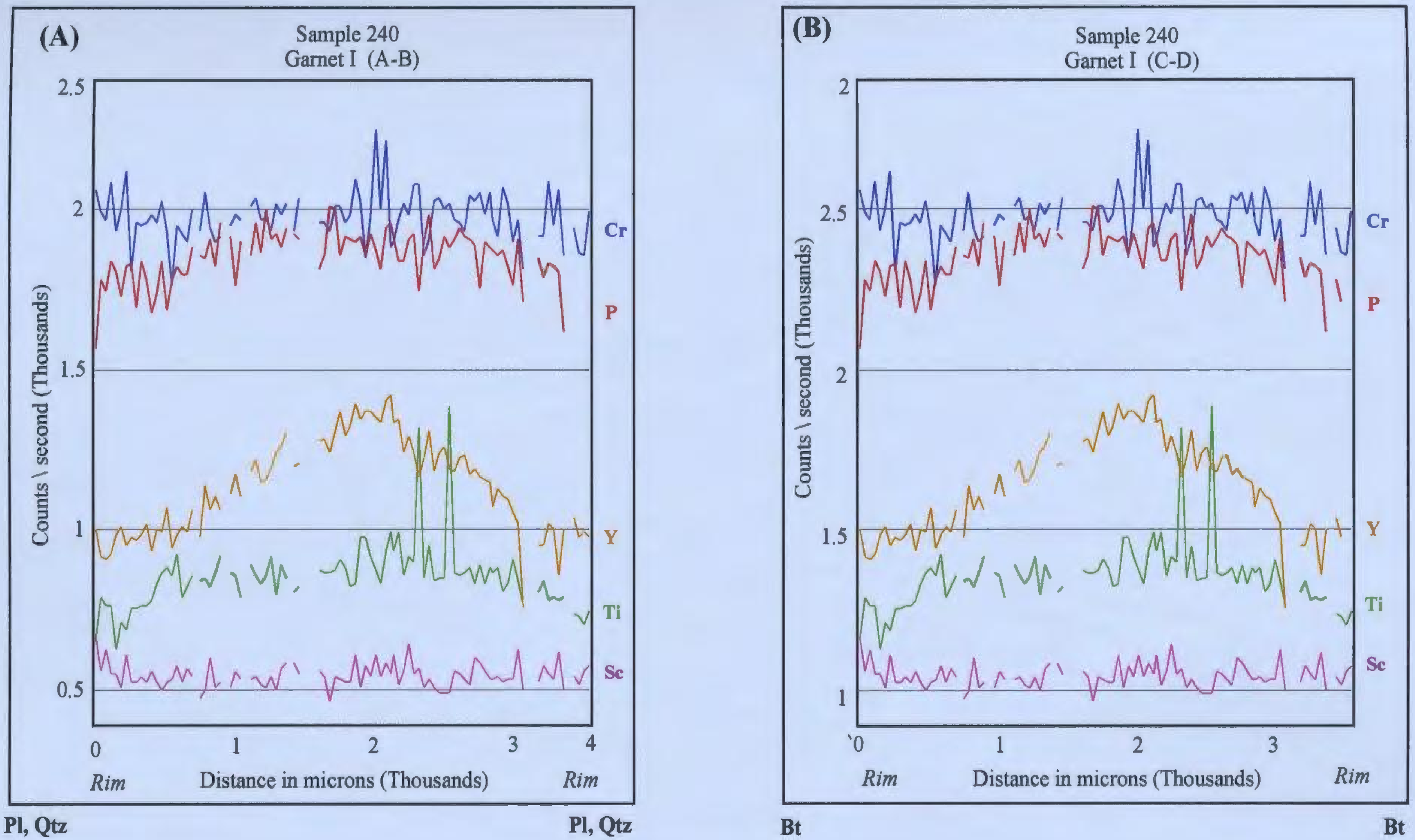


Figure 8.9: Zoning profiles of Garnet I from sample 240 in terms of counts / second of P, Ti, Sc, Y, and Cr along (A) transect A-B and (B) transect C-D. See Plate 8.3 for location of transects. Rims A and B are in contact with Pl and Qtz; rims C and D are in contact with Bt.

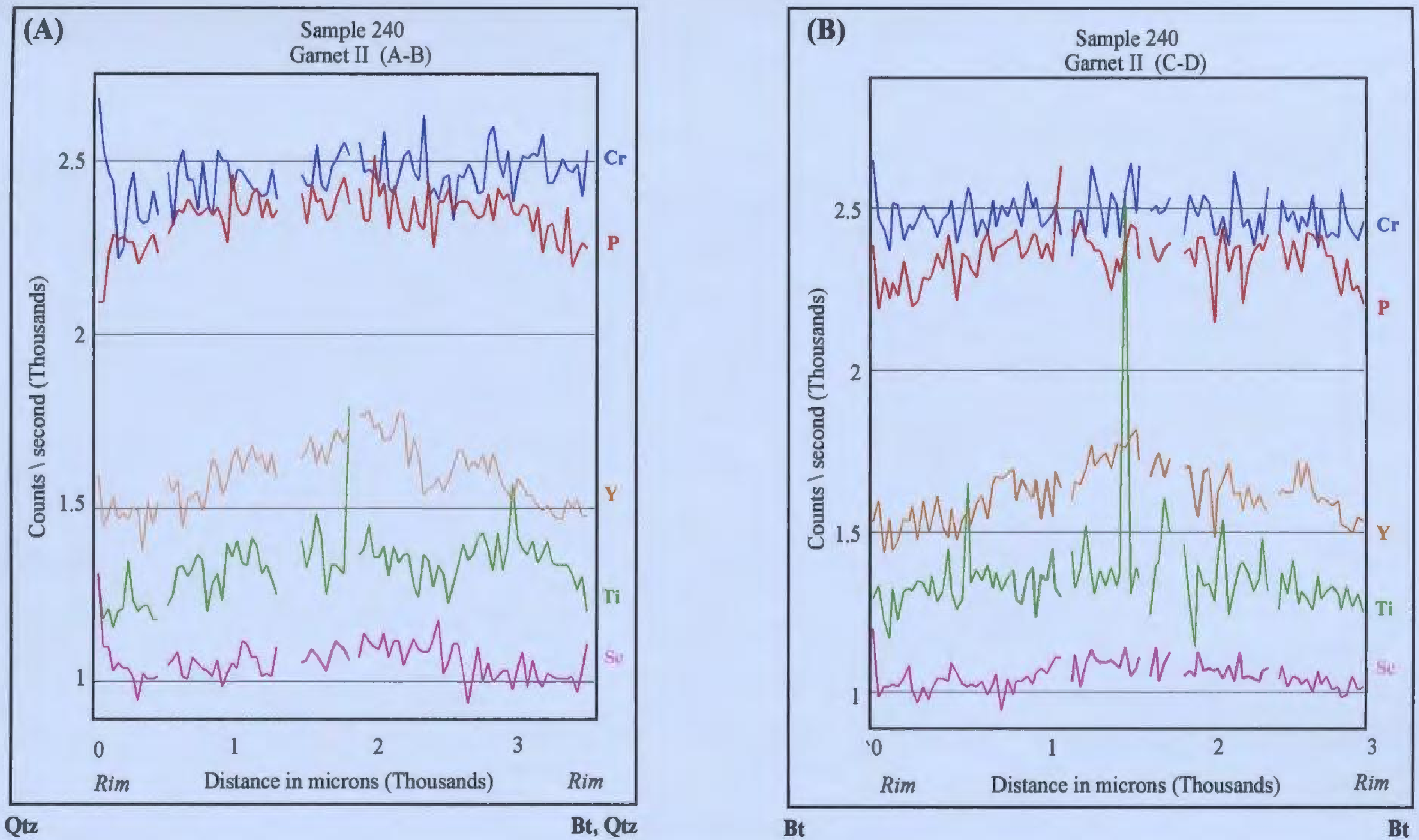


Figure 8.10: Zoning profiles of Garnet II from sample 240 in terms of counts / second of P, Ti, Sc, Y, and Cr along (A) transect A-B and (B) transect C-D. See Plate 8.3 for location of transects. Rim A is in contact with Qtz; rim B with Bt and Qtz; and both rims C and D are in contact with Bt.

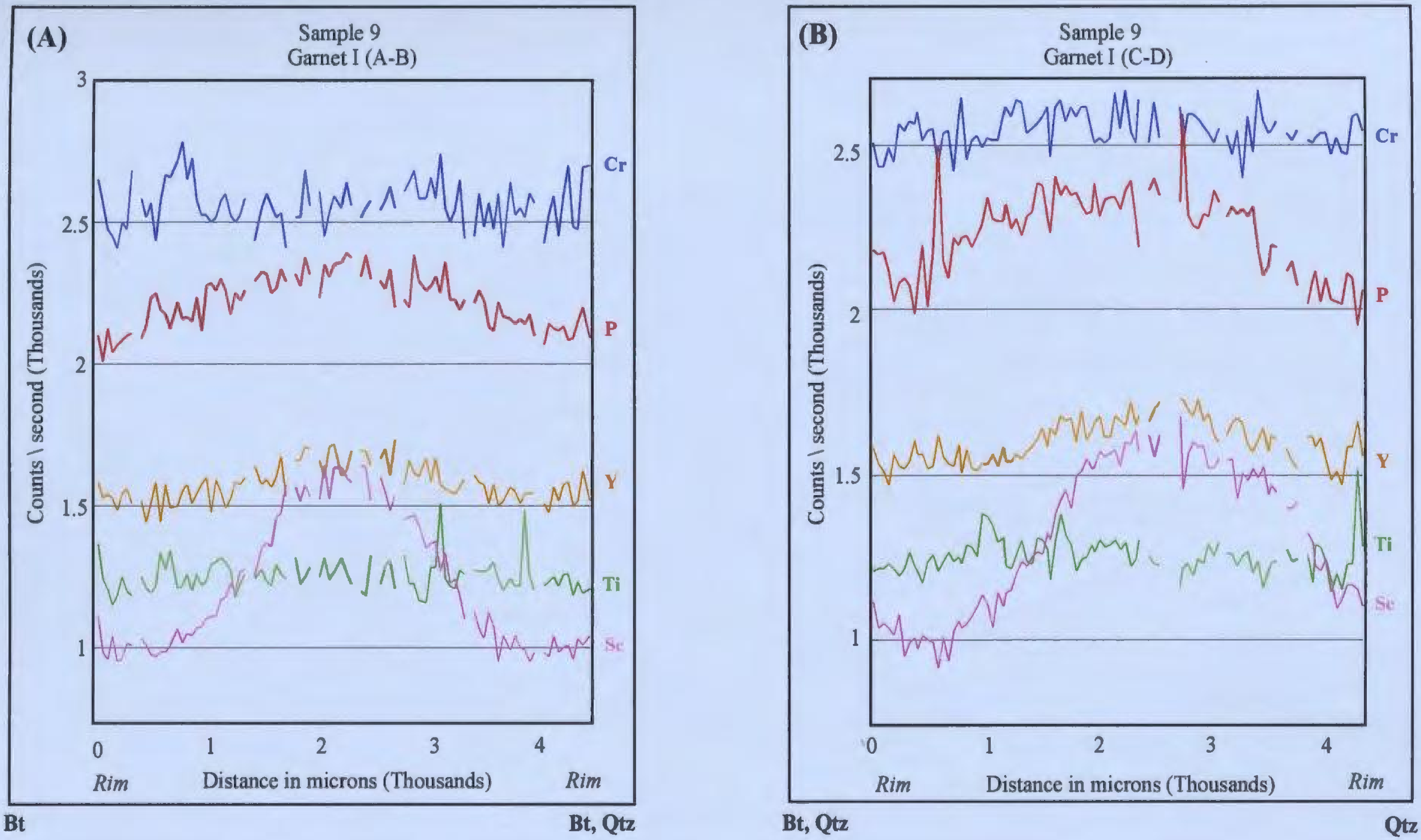


Figure 8.11: Zoning profiles of Garnet I from sample 9 in terms of counts / second of P, Ti, Sc, Y, and Cr along (A) transect A-B and (B) transect C-D. See Plate 8.4 for location of transects. Rim A is in contact with Bt; rims B and C with Bt and Qtz; and rim D with Qtz.

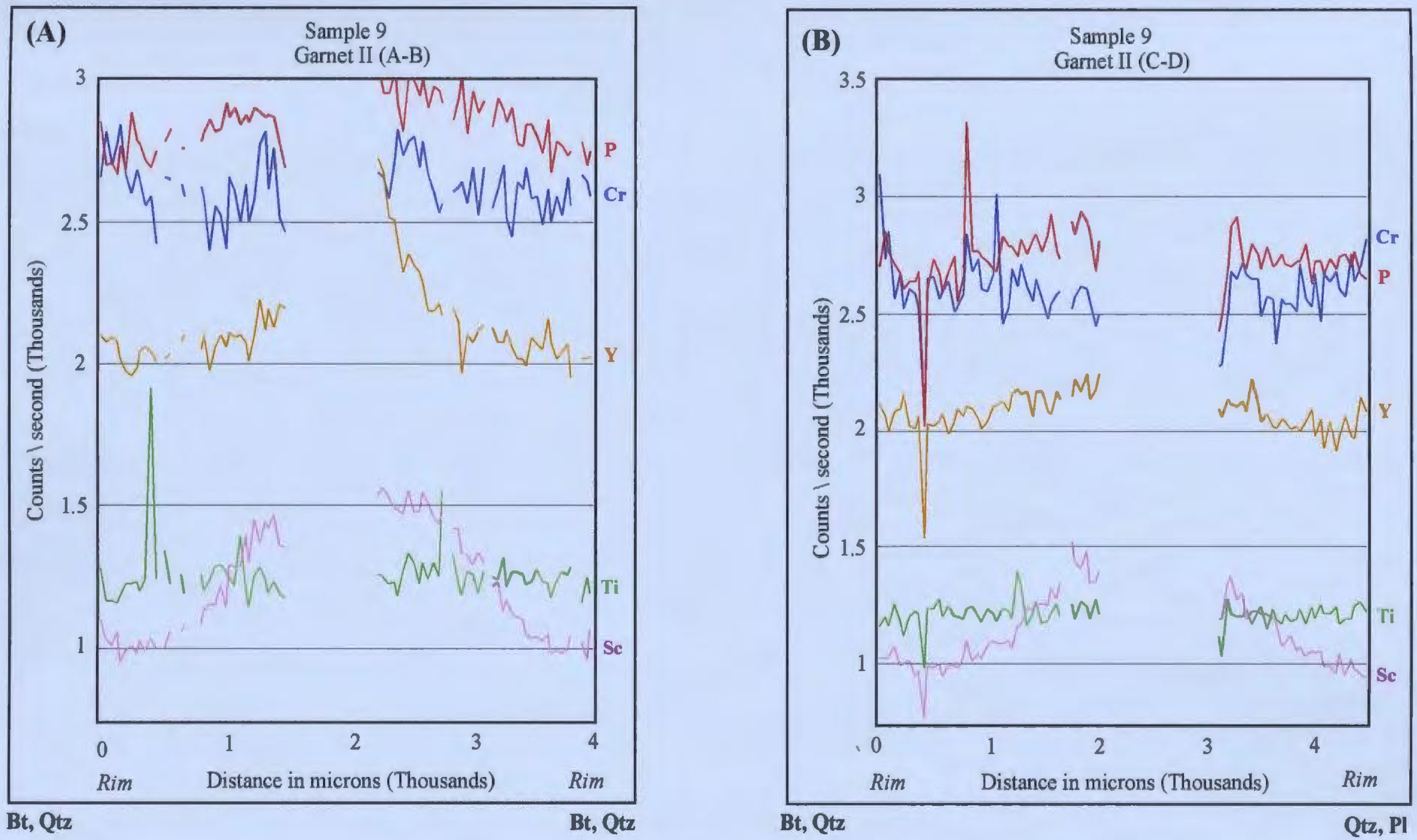


Figure 8.12: Zoning profiles of Garnet II from sample 9 in terms of counts / second of P, Ti, Sc, Y, and Cr along (A) transect A-B and (B) transect C-D. See Plate 8.5 for location of transects. Rims A, B and C are in contact with Bt and Qtz; rim D is in contact with Qtz and Pl.

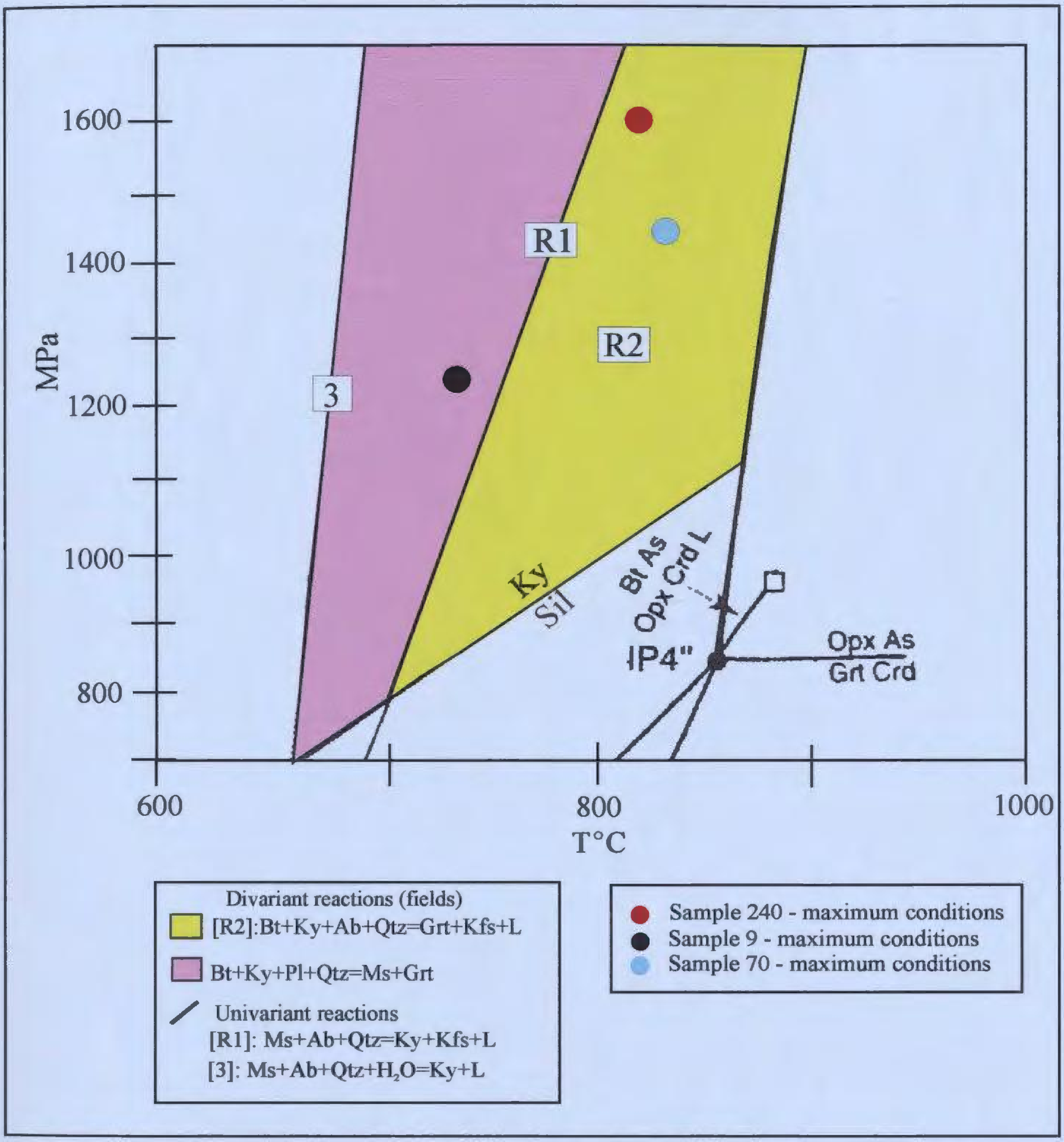


Figure 8.13: *P-T* diagram showing the location of selected melting reactions in the kyanite field (NaKFMASH system, modified after Spear et al. 1999) and the maximum conditions for studied samples in the Lac Opocopa area (Indares 1995).

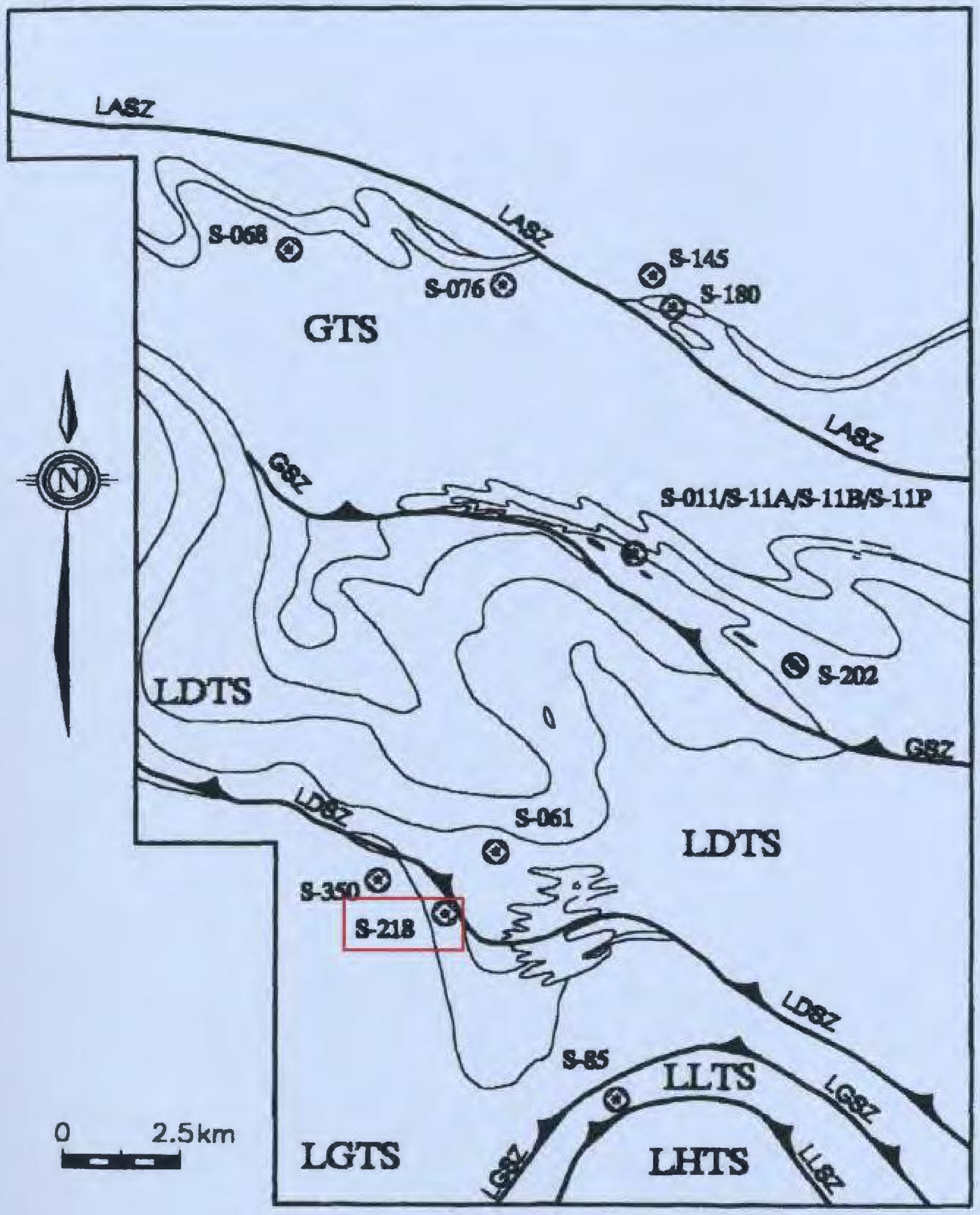


Figure 8.14: Map of sample locations studied by Schwarz (1998). Outlined sample S-218 has been chosen for re-examination in the present study. Abbreviations: GTS-Gueslis thrust slice, LDTS- Lac Don thrust sheet, LGTS- Lac Lamêlée thrust sheet, GSZ - Gueslis shear zone, LASZ- Lac Audréa shear zone, LGSZ- Lac Gull shear zone, LLSZ- Lac Lamêlée shear zone.

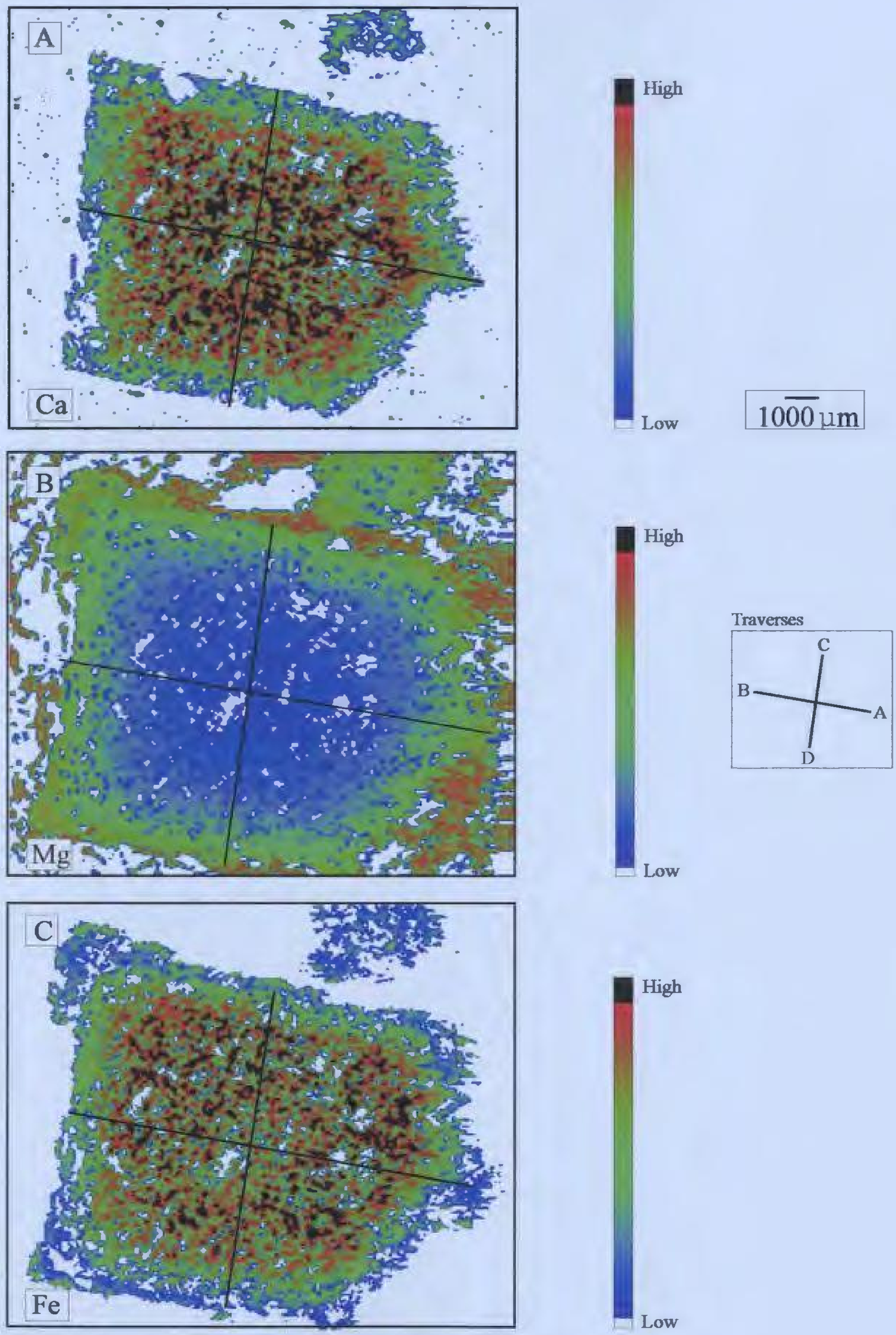


Figure 8.15: X-ray compositional maps of a garnet porphyroblast from sample S-218 in terms of (A) Ca, (B) Mg and (C) Fe.

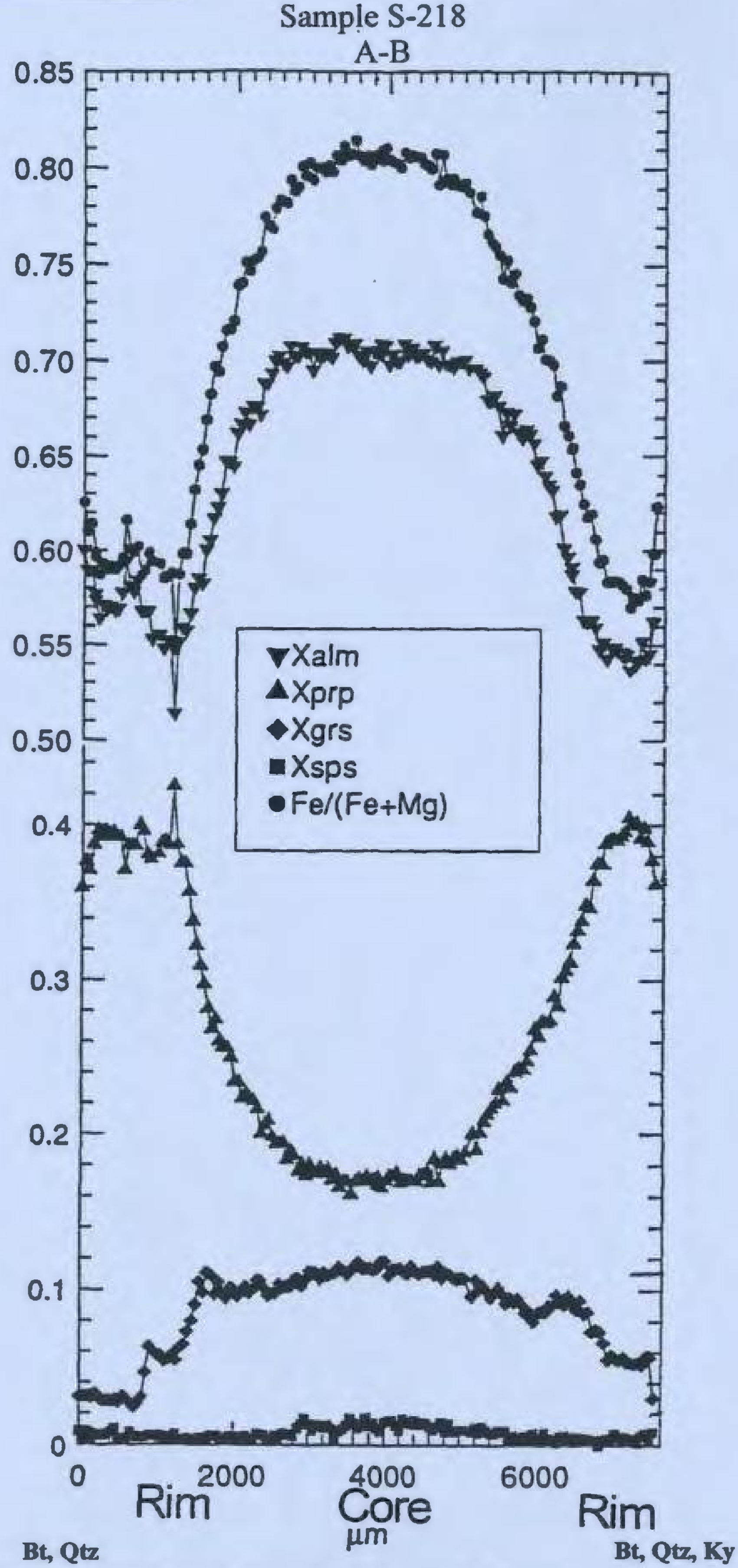


Figure 8.16: Zoning profile of a garnet porphyroblast from sample S-218 (from Schwarz 1998) along traverse A-B. See Plate 8.10 for location of transect. Both rims are in contact with Bt and Qtz while rim B is also in contact with Ky.

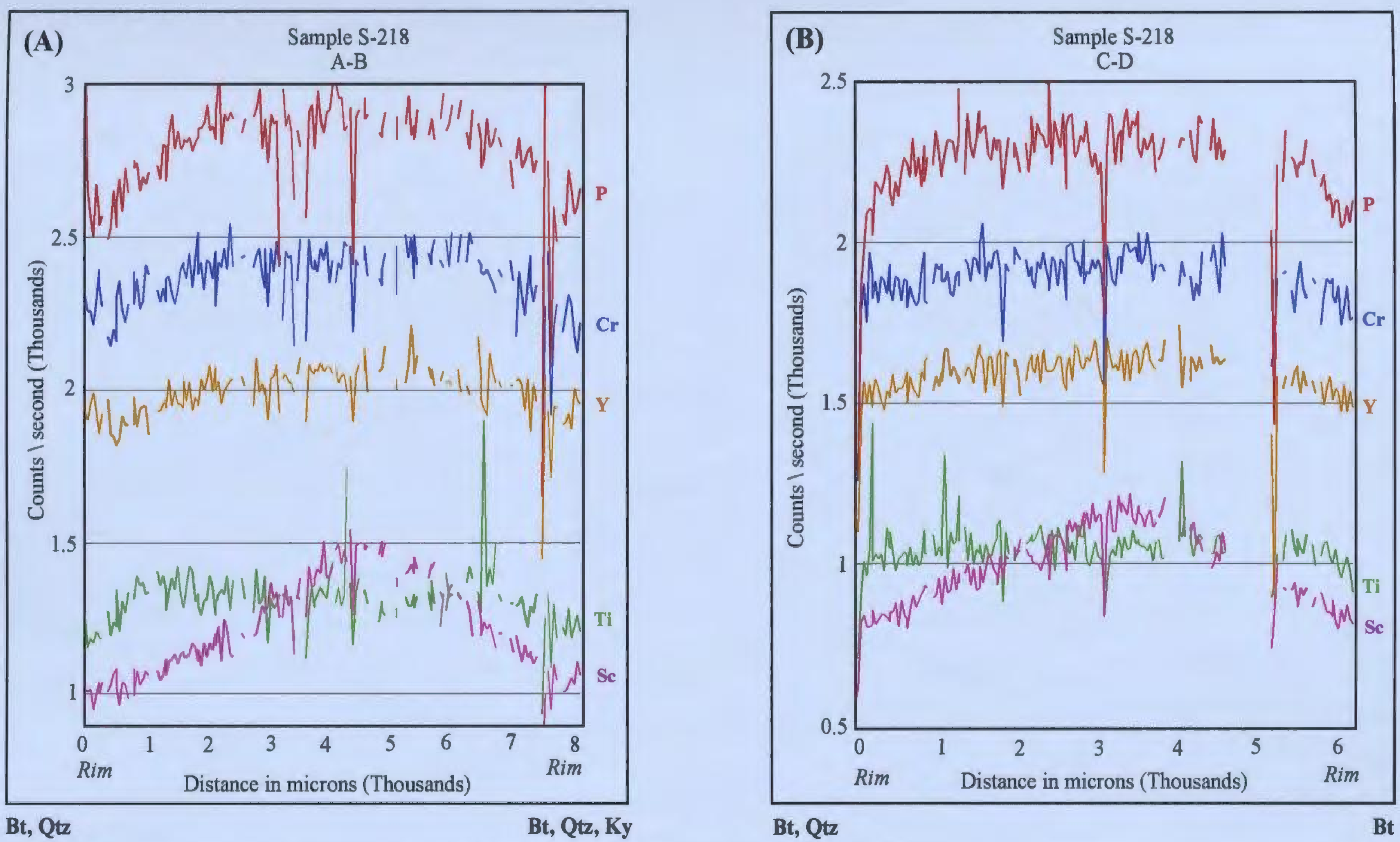


Figure 8.17: Zoning profiles of a garnet from sample S-218 in terms of counts / second of P, Ti, Sc, Y, and Cr along (A) transect A-B and (B) transect C-D. See Plate 8.10 for location of transects. Rims A, B and C are in contact with Bt and Qtz with rim B also being in contact with Ky; rim D is in contact with Bt only.

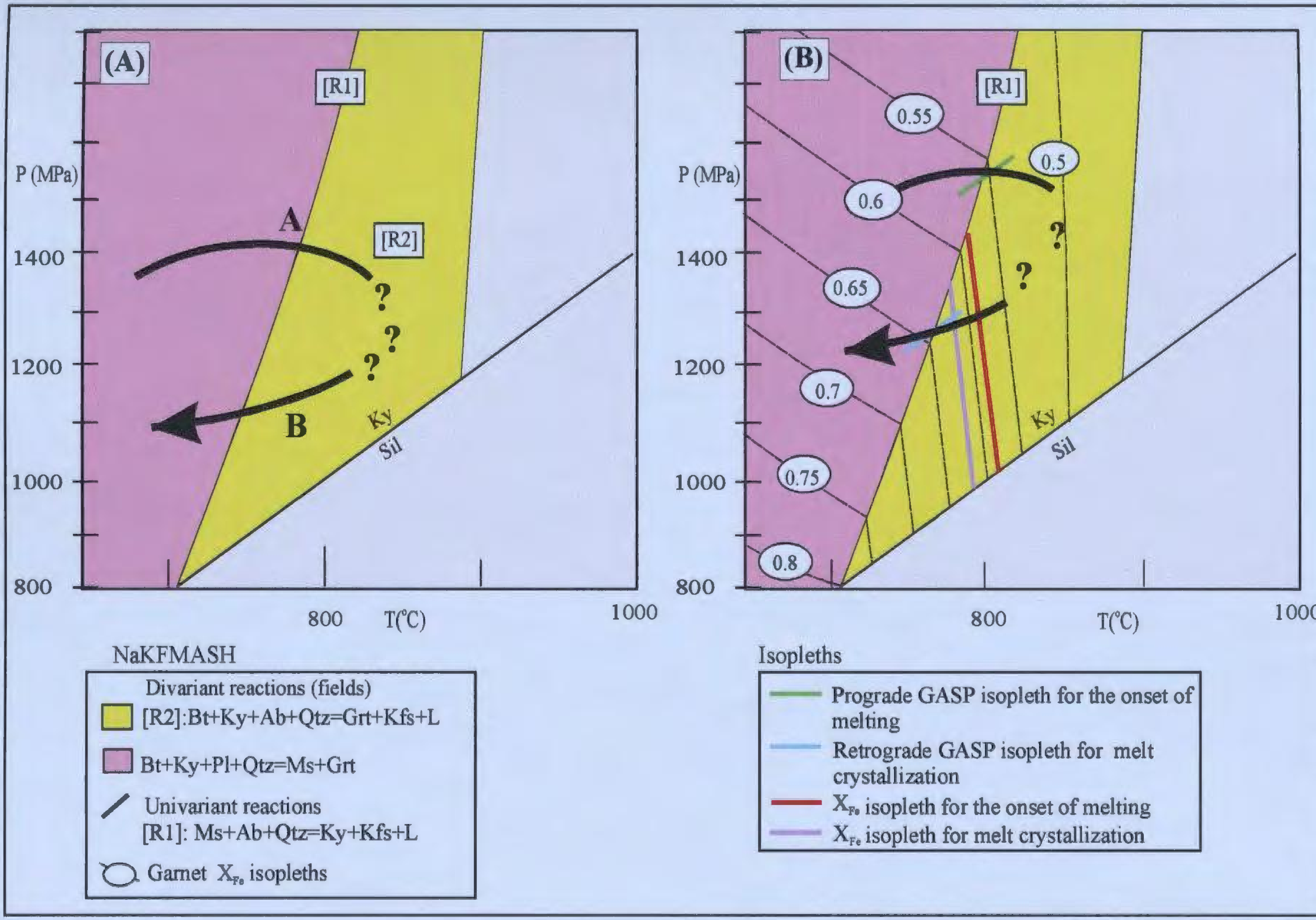


Figure 8.18: *P-T* diagram showing the locations of selected melting reactions in the kyanite field (NaKFMASH system (modified after Spear et al. 1999); and the proposed *P-T* path for sample S-218. (A) qualitative *P-T* path deduced from textural interpretations (B) *P-T* path constrained by GASP isopleths. Also shown are selected X_{Fe} isopleths.

Table 8.1: Representative garnet analyses from the Lac Opocopa area (Indares 1995).

		Oxide percentage							Cations on a 12 (O) basis							Molar fraction					
Sample #	Type	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
70	Ca peak	29.58	3.50	6.96	0.30	20.89	37.99	99.31	1.94	0.48	0.58	0.01	1.96	3.02	8.01	0.65	0.14	0.20	0.02	0.80	0.20
	rim	31.97	4.88	2.99	0.92	21.14	37.42	99.35	2.13	0.58	0.25	0.06	1.99	2.99	8.00	0.70	0.19	0.07	0.02	0.79	0.21
240	Ca peak	29.58	4.31	5.69	0.43	21.54	38.62	100.1	1.94	0.50	0.48	0.03	1.99	3.03	7.97	0.66	0.17	0.16	0.01	0.80	0.20
	rim	27.10	7.96	3.87	0.23	21.94	39.26	100.4	1.74	0.91	0.32	0.01	1.99	3.02	7.99	0.58	0.31	0.10	0.01	0.66	0.44
9	core	29.80	4.16	4.41	2.94	21.16	38.44	100.9	1.92	0.04	0.49	0.37	1.96	3.02	8.00	0.65	0.16	0.11	0.07	0.98	0.02
	rim	30.86	5.37	1.17	3.40	21.59	38.68	101.0	2.01	0.01	0.63	0.10	1.99	3.02	7.98	0.68	0.21	0.03	0.08	0.97	0.04

Table 8.2: Representative biotite analyses from the Lac Opocopa area (Indares 1995). T3=biotite adjacent to garnet and T4= biotite isolated from garnet in the matrix.

Sample #		Oxide percentage								Cations on an 11(O) basis									
	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	Na_2O	TiO_2	Total	K	Si	Al^{VI}	Al^{IV}	Fe	Mg	Na	Ti	X_{Fe}	X_{Mg}
70	T4	9.39	36.86	18.89	16.52	11.26	0.25	2.78	95.94	0.89	2.74	0.38	1.26	1.02	1.25	0.03	0.16	0.45	0.55
	T3	9.37	37.11	19.70	16.37	11.16	0.22	2.81	95.75	0.88	2.74	0.45	1.26	0.95	1.23	0.03	0.16	0.44	0.56
240	T4	8.65	38.59	17.19	11.86	15.03	0.42	3.25	95.08	0.81	2.81	0.28	1.19	0.72	1.63	0.06	0.18	0.31	0.69
	T3	8.76	38.69	18.19	12.09	15.33	0.55	2.29	95.89	0.81	2.80	0.35	1.20	0.73	1.65	0.08	0.13	0.31	0.69
9	T4	8.03	37.52	18.81	15.61	12.18	0.42	2.18	94.74	0.76	2.78	0.41	1.22	0.97	1.35	0.06	0.12	0.42	0.58
	T3	7.77	37.85	19.28	15.98	12.37	0.41	2.19	95.84	0.72	2.77	0.43	1.23	0.98	1.35	0.06	0.12	0.42	0.58

Table 8.3: Representative plagioclase analyses from the Lac Opocopa area (Indares 1995).

Sample #	Type	Oxide percentage						Cations on an 8 (O) basis					Molar fraction		
		Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	X_{Ab}	X_{An}	X_{Or}
70	core	8.66	4.54	0.16	23.02	63.52	99.91	0.74	0.21	0.01	23.02	2.81	0.77	0.22	0.01
	rim	8.34	5.66	0.07	23.91	61.46	99.51	0.72	0.27	0.00	1.26	2.74	0.72	0.27	0.00
240	core	9.93	3.19	0.05	22.11	64.80	100.08	0.85	0.15	0.00	1.15	2.85	0.85	0.15	0.00
	rim	9.63	3.55	0.03	22.75	63.69	99.77	0.83	0.17	0.00	1.19	2.82	0.83	0.17	0.00
9	core	10.39	2.44	0.05	21.32	64.85	98.97	0.89	0.12	0.00	1.12	2.88	0.88	0.11	0.00
	rim	9.72	2.47	0.02	21.42	65.06	98.69	0.84	0.12	0.00	1.12	2.89	0.87	0.12	0.00

Table 8.4: Representative garnet analyses from sample S-218 in the Lac Andréa area (Schwarz 1998).

	Oxide percentage							Cations on a 12 (O) basis							Molar fraction					
Type	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
11	27.34	9.19	1.11	0.41	22.09	38.96	99.13	1.77	1.06	0.09	0.03	2.01	3.01	7.98	0.60	0.36	0.03	0.01	0.63	0.37
2	26.68	9.57	1.10	0.12	22.03	39.27	98.82	1.72	1.10	0.09	0.01	2.00	3.03	7.96	0.59	0.38	0.03	0.00	0.61	0.39
17	26.13	10.28	0.96	0.23	21.84	38.84	98.21	1.70	1.19	0.08	0.01	2.00	3.02	7.99	0.57	0.40	0.03	0.01	0.59	0.41
18	25.99	10.16	1.09	0.23	22.29	39.72	99.56	1.66	1.16	0.09	0.01	2.01	3.03	7.96	0.57	0.40	0.03	0.01	0.59	0.41
26	25.35	9.92	1.93	0.31	21.86	39.21	98.54	1.64	1.14	0,16	0.02	1.99	3.03	7.98	0.55	0.39	0.05	0.01	0.59	0.41
34	27.38	7.06	3.85	0.12	21.44	38.82	98.66	1.79	0.83	0.32	0.01	1.98	3.04	7.97	0.61	0.28	0.10	0.00	0.68	0.32
41	29.99	5.86	3.47	0.23	21.23	38.52	99.32	1.98	0.69	0.29	0.02	1.97	3.04	7.98	0.66	0.23	0.09	0.01	0.74	0.26
72	31.32	3.99	3.88	0.74	21.14	37.94	99.17	2.09	0.48	0.33	0.05	1.99	3.03	7.97	0.71	0.16	0.11	0.02	0.81	0.29
121	28.84	6.70	2.78	0.31	21.28	38.24	98.37	1.91	0.79	0.24	0.02	1.98	3.02	7.97	0.65	0.27	0.07	0.01	0.52	0.48
126	27.62	7.25	3.14	0.14	21.57	38.65	98.54	1.81	0.85	0.26	0.01	1.99	3.03	7.96	0.62	0.29	0.08	0.00	0.68	0.32
146	25.26	10.58	1.93	0.23	22.06	39.70	99.86	1.61	1.20	0.16	0.01	1.98	3.02	7.98	0.54	0.41	0.04	0.00	0.57	0.43
152	25.66	9.65	2.02	0.15	21.86	38.77	98.11	1.67	1.12	0.17	0.01	2.00	3.01	7.98	0.56	0.38	0.06	0.00	0.60	0.40
153	27.01	9.15	1.08	0.38	21.87	39.14	98.67	1.75	1,06	0.09	0.02	2.00	3.04	7.96	0.60	0.36	0.03	0.01	0.66	0.34

Table 8.5: Representative biotite analyses from sample S-218 in the Lac Andréa area (Schwarz 1998).
d=distal to garnet; p=proximal to garnet

Analysis #	Oxide percentage								Cations on an 11(O) basis									
	K_2O	SiO_2	Al_2O_3	FeO	MgO	Na_2O	TiO_2	Total	K	Si	Al^{VI}	Al^{IV}	Fe	Mg	Na	Ti	X_{Fe}	X_{Mg}
1-1d	9.40	35.39	16.69	10.05	14.46	0.48	3.39	89.98	0.93	2.74	0.27	1.26	0.65	1.67	0.07	0.20	0.28	0.72
1-2	9.35	38.04	17.70	10.42	15.80	0.61	3.42	95.30	0.87	2.77	0.28	1.23	0.63	1.71	0.09	0.19	0.27	0.73
1-3	9.03	37.04	17.50	10.27	15.29	0.66	3.18	93.20	0.86	2.76	0.29	1.24	0.64	1.70	0.10	0.18	0.27	0.73
1-4	9.40	37.77	18.00	10.46	15.78	0.48	3.53	95.43	0.87	2.74	0.28	1.26	0.64	1.71	0.07	0.19	0.27	0.73
1-5p	9.49	36.21	16.89	10.02	15.37	0.48	2.47	90.87	0.93	2.77	0.29	1.23	0.64	1.75	0.07	0.14	0.27	0.73
3-1p	9.17	35.93	16.90	9.58	14.71	0.30	3.12	89.92	0.90	2.77	0.30	1.23	0.62	1.69	0.04	0.18	0.27	0.73
3-2	9.03	35.66	17.14	9.84	14.82	0.63	2.96	90.24	0.89	2.74	0.30	1.26	0.63	1.70	0.09	0.17	0.27	0.73
3-3	9.57	37.84	17.94	9.79	15.98	0.45	3.08	94.76	0.89	2.76	0.31	1.24	0.60	1.74	0.06	0.17	0.26	0.74
3-4	8.70	38.16	18.25	10.74	15.59	0.62	2.73	94.83	0.81	2.78	0.34	1.22	0.65	1.69	0.09	0.15	0.28	0.72
3-5	9.07	36.22	17.30	10.00	14.77	0.50	2.98	91.05	0.88	2.76	0.31	1.24	0.64	1.68	0.07	0.17	0.28	0.72
3-6	8.72	36.38	17.22	9.9	14.95	0.65	2.89	91.05	0.85	2.76	0.31	1.23	0.63	1.70	0.10	0.17	0.27	0.73
3-7	9.46	38.28	19.93	10.29	16.34	0.48	3.05	95.9	0.87	2.76	0.29	1.24	0.62	1.76	0.07	0.17	0.26	0.74
3-8	9.25	37.15	17.49	10.16	15.40	0.38	3.01	92.87	0.88	2.77	0.31	1.23	0.63	1.71	0.05	0.17	0.27	0.73
3-9	9.51	38.10	17.67	10.47	15.89	0.54	3.15	95.35	0.88	2.77	0.29	1.23	0.64	1.72	0.08	0.17	0.27	0.73
3-10	9.37	37.68	17.74	10.57	15.74	0.61	2.99	94.79	0.88	2.76	0.29	1.24	0.65	1.72	0.09	0.17	0.27	0.73
3-12	9.58	38.30	17.94	10.55	16.22	0.52	3.03	96.15	0.88	2.77	0.29	1.24	0.64	1.74	0.07	0.16	0.27	0.73
3-13	7.99	32.94	15.34	8.18	13.06	0.77	2.74	81.17	0.87	2.80	0.34	1.20	0.58	1.65	0.13	0.18	0.26	0.74
3-15	8.16	32.61	15.01	8.19	13.06	0.48	2.8	80.41	0.89	2.80	0.32	1.20	0.59	1.67	0.08	0.18	0.26	0.74
3-16d	7.64	31.53	14.20	7.85	12.39	0.40	2.58	76.38	0.88	2.84	0.35	1.16	0.59	1.66	0.07	0.18	0.26	0.74

Table 8.6: Representative plagioclase analyses from sample S-218 in the Lac Andréa area. T4= plagioclase isolated from garnet in the matrix.

Grain # and type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 2 T4	1	0	9.59	3.15	0.00	21.58	61.54	96.21	0.85	0.15	0.00	1.17	2.82	5.02	0.85	0.15	0.00
	2	20	9.72	2.58	0.03	20.83	61.89	95.02	0.87	0.12	0.00	1.14	2.87	5.00	0.87	0.13	0.00
	3	41	10.01	2.29	0.11	20.90	63.24	96.45	0.88	0.11	0.01	1.12	2.88	5.00	0.88	0.11	0.01
	4	61	10.20	2.33	0.06	21.51	64.28	98.32	0.88	0.11	0.00	1.13	2.87	5.00	0.89	0.11	0.00
	5	82	10.56	2.28	0.10	20.79	63.15	96.78	0.93	0.11	0.01	1.12	2.87	5.03	0.89	0.11	0.01
	6	102	10.28	2.18	0.09	21.25	62.79	96.50	0.91	0.11	0.01	1.14	2.86	5.02	0.89	0.10	0.01
	7	123	9.97	2.27	0.19	20.77	62.94	96.52	0.88	0.11	0.01	1.12	2.87	5.02	0.88	0.11	0.01
	8	143	10.01	2.20	0.23	20.84	63.16	96.43	0.89	0.11	0.01	1.12	2.88	5.01	0.88	0.11	0.01
	9	164	9.98	2.35	0.10	21.23	62.81	96.37	0.88	0.11	0.01	1.14	2.87	5.00	0.88	0.11	0.01
	10	184	9.21	2.37	0.11	21.50	63.28	97.07	0.87	0.11	0.01	1.15	2.86	5.00	0.88	0.12	0.01
Grain 8 T4	1	0	9.27	3.83	0.06	22.27	61.73	97.10	0.82	0.19	0.00	1.19	2.81	5.00	0.81	0.19	0.00
	2	19	8.75	3.44	0.23	21.23	59.02	95.27	0.80	0.17	0.01	1.17	2.77	5.05	0.81	0.18	0.01
	3	39	9.32	3.28	0.20	21.28	61.45	95.54	0.83	0.16	0.01	1.16	2.83	5.01	0.83	0.16	0.01
	4	58	9.73	3.29	0.09	21.59	62.33	96.94	0.86	0.16	0.00	1.16	2.84	5.01	0.84	0.16	0.00
	5	78	9.94	3.15	0.18	21.52	61.39	96.18	0.89	0.16	0.01	1.17	2.82	5.04	0.84	0.15	0.01
	6	97	9.12	3.34	0.17	21.99	61.95	96.56	0.81	0.16	0.00	1.18	2.83	4.99	0.82	0.17	0.01
	7	117	9.55	3.45	0.17	21.93	62.08	97.82	0.84	0.17	0.00	1.17	2.81	5.03	0.83	0.16	0.01
	8	136	9.32	3.62	0.12	22.08	61.52	96.54	0.83	0.18	0.01	1.19	2.81	5.01	0.82	0.18	0.00
	9	156	9.17	3.88	0.09	21.96	60.88	95.89	0.82	0.19	0.01	1.19	2.81	5.01	0.81	0.19	0.00
	10	175	9.17	3.91	0.06	21.86	60.33	95.28	0.83	0.19	0.00	1.20	2.80	5.02	0.81	0.19	0.00

CHAPTER 9: CONCLUSIONS

9.1. PARTIAL MELTING HISTORY OF MIGMATITIC METAPELITES FROM THE SW GAGNON TERRANE AND SUGGESTED *P-T* PATHS

In kyanite-bearing metapelites of the SW Gagnon terrane, the absence of primary muscovite and the presence of K-feldspar and kyanite indicates that reactions such as Ms + Qtz + Ab = Kfs + Ky + L ([R1]) or Phe + Ab + Qtz = Bt + Ky + Kfs + L ([R1a]), which are responsible for dehydration melting of white mica, have been crossed and that metamorphic conditions reached the *P-T* field of the continuous biotite dehydration melting reaction Bt + Ky + Qtz + Ab = Grt + Kfs + L ([R2]). Leucosome is represented by quartz ± plagioclase + K-feldspar pods and layers that alternate with restitic domains richer in aluminous and ferromagnesian minerals (example sample 100, slice #1; sample 207, slice #3. Aggregates and layers of coarse-grained quartz that have been observed in some samples (example sample 100, slice #1) are interpreted to represent solid residuum. In addition, K-feldspar + quartz + albite aggregates included in the core region of a garnet porphyroblast (sample 207, slice #3) are interpreted as melt pockets trapped during garnet growth. The operation of reaction [R2] is further supported by textural evidence of replacement of kyanite by K-feldspar (sample 282, slice #3) and in some samples there is evidence that garnet grew, in part at least, by this reaction. In some cases, garnet zoning provided further constraints on the reaction sequence. For instance, in the northernmost slice (sample 100, slice #1) homogeneous garnet cores variably enriched in Y are surrounded by Grs and Cr-enriched rims, consistent with initial growth by subsolidus reaction(s) followed by development of the rim domains by reaction [R2].

Quartz + K-feldspar + albite inclusions in the core of a garnet porphyroblast (sample 207, slice #3), which are interpreted as melt pockets, suggest that the entire porphyroblast grew in the presence of melt, i.e. by biotite dehydration melting. However, Ca- (and locally P) enrichment in the rims suggests a change in the growth reaction. Theoretically this may happen if the original white mica was phengite instead of muscovite. In this case, with increasing temperature the sequence of the melting reactions would be: (a) [R3]: Phe + Bt + Ab = Grt + Kfs + L which is a continuous NaKFMASH reaction that produced garnet, (b) [R_{II}]: Grt + Phe + (Ab) + Qtz = Bt + Ky + Kfs + L, a discontinuous NaKFMASH reaction that consumes garnet, and (c) reaction [R2] that produces garnet again (Figure 2.6). In fact this is the only evidence so far that dehydration melting of phengite (instead of muscovite) may have occurred.

The studied samples also display a number of textures that are related to melt crystallization during the retrograde *P-T* evolution. Garnet is variably corroded by biotite + quartz ± kyanite ± plagioclase (example sample 100, slice #1; sample 207, slice #3) which is likely a result of reaction [R2] operating in the reverse sense. This interpretation is further supported by local Sps and X_{Fe} increase and Grs decrease at the outer rims of corroded garnet, high X_{Fe} in some biotite grains in aggregates replacing garnet and reverse zoning of plagioclase adjacent to these aggregates.

Intergrowths of biotite + muscovite (sample 100, slice #1; sample 282, slice #3) and biotite + muscovite + quartz (sample 208, slice #3) as well as muscovite porphyroblasts enclosing relict kyanite and plagioclase (sample 208, slice #3) and replacing K-feldspar (sample 100, slice #1) are consistent with operation of reactions [R2] and [R1] in the reverse sense, and final melt crystallization in the muscovite stability field. The relatively small size of the biotite grains in some samples (for example, samples 287 and 288, location #4) suggest that it is mostly retrograde, and likely produced by reaction [R2] during cooling.

By using the intersection between relevant GASP isopleths and reaction [R1] in both the prograde and retrograde direction, it is estimated that in the metapelites from the thrust slices, the prograde path crossed the white mica dehydration melting reaction in the range of 1140-1450 MPa and 750-780°C (Figure 9.1). Therefore, no reliable regional gradient was detected within the limitations of the modified thermobarometry utilized in this study. The *P-T* history subsequently followed a retrograde path with melt crystallization starting in the field of reaction [R2], again in the stability field of kyanite, and ending in the muscovite stability field. The *P-T* conditions of crossing reaction [R1] in the reverse sense were estimated at approximately 930-1100 MPa and 722-748°C (Figure 9.1). These data suggest that there was not significant decompression between the prograde and retrograde portions of the *P-T* path.

Migmatitic metapelites also occur in a shear zone that bounds the Gagnon terrane to the south. However, in contrast to the metapelites described previously, these contain sillimanite instead of kyanite. These metapelites also preserve textural evidence of reactions [R1] and [R2], however, which aluminosilicate was present during the prograde part of the path is unclear because sillimanite appears texturally retrograde, i.e., produced by melt crystallization (Figure 9.1). Therefore, it is possible that kyanite was present along the prograde path at the peak, and was entirely consumed during melting by reaction [R2]. If this is the case, significant decompression between melt production and melt crystallization would be implied.

9.2 ANATECTIC METAPELITES FROM OTHER AREAS OF THE GAGNON TERRANE

In the northeastern Gagnon terrane, leucosome are generally associated with meta-semipelitic (muscovite-free) rocks and are attributed to the vapor-present reaction Qtz + Pl + Kfs + H_2O = L (Rivers 1983a; van Gool 1992) while muscovite-bearing pelitic rocks in this area do not show evidence for partial melting. Further south, however, there is a transition between these muscovite-bearing metapelites to kyanite + K-feldspar-bearing migmatitic metapelites which is marked by a zone in which leucosome occasionally occur in muscovite-bearing rocks (example, Lac Opocopa area). The presence of primary muscovite and kyanite and the absence of K-feldspar in these rocks are suggestive of the fluid-present melting reaction muscovite + quartz + albite + H_2O = kyanite + liquid [3] which is a discontinuous NaKASH reaction that occurs at lower temperatures than [R1]. Completion of reaction [3] may have been followed by the divariant NaKFMASH vapour-absent reaction biotite + kyanite + plagioclase + quartz = garnet + muscovite. This reaction is consistent with concentric Grs peaks in garnet rims which indicate that garnet growth occurred in the presence of melt. This inference, if correct, shows that the presence of Grs-enriched rims in garnet are not exclusively associated with dehydration melting of micas. Maximum estimated conditions (Indares 1995), however, range from 1180-1600 MPa and 720-840°C (Figure 9.1) which actually exceed reaction [R1] and fall within the field of reaction [R2]. The presence of An in the plagioclase may account for this discrepancy because the location of reaction [R1] in the CaNKFMASH system would be displaced to higher temperatures in proportion to the amount of Ca in the system.

Farther south in the Lac Audréa area, there is a transition to kyanite-bearing migmatitic metapelites with the fluid-absent reaction sequence being followed by dehydration melting of micas by reactions [R1] and [R2]. This interpretation is supported by both textural and garnet zoning evidence. The presence of K-feldspar and kyanite and the absence of primary muscovite indicate that reaction [R1] has been exceeded and that the *P-T* path has reached the field of reaction [R2]. Garnet porphyroblasts display two sets of concentric Grs peaks outwards from the subsolidus core with the first set being formed by a divariant reaction such as Bt + Ky + Ab + Qtz = Grt + Ms following vapour-present melting by reaction [3] while the second set formed during biotite dehydration melting by reaction [R2]. However, the presence of corroded biotite porphyroblasts, which are interpreted as prograde, suggests that reaction [R2] did not proceed until completion. Estimated *P-T* conditions indicate that these rocks followed roughly the same type of metamorphic evolution as thrust slices #1 - #3 of the SW Gagnon terrane with biotite dehydration melting beginning at 1525 MPa and 795°C and final melt crystallization at 1280 MPa and 770°C (Figure 9.1). The main difference, however, between kyanite + K-feldspar migmatitic metapelites from the SW and the eastern Gagnon terrane is that in the former there is no evidence of fluid-present melting reactions predating dehydration melting of micas, whereas in the latter there is.

9.3 TECTONIC IMPLICATIONS

The Gagnon terrane is one of the largest coherent areas of kyanite + K-feldspar gneisses known anywhere in the world. Adding to its uniqueness is that it is parautochthonous, and its lithological units can be traced to the north through a medium-pressure Barrovian sequence to the Grenville Front where rocks are at greenschist facies. While it is acknowledged that there are major thrust faults within the Gagnon terrane, the metamorphic pattern deduced from the present and previous studies is rather unusual in that Knob Lake Group rocks which have been transported to 1400 MPa (~40 km) are preserved at the same level as rocks from the same group buried to only 600 MPa (~18 km). This is consistent, however, with the tectonic models discussed in section 1.4.3 which suggest that HP rocks in the SW Gagnon terrane were also deeply buried before they became incorporated into the ductile shear zone at the interface of the HP belt and subsequently exhumed along a crustal scale ramp by NW-directed transport.

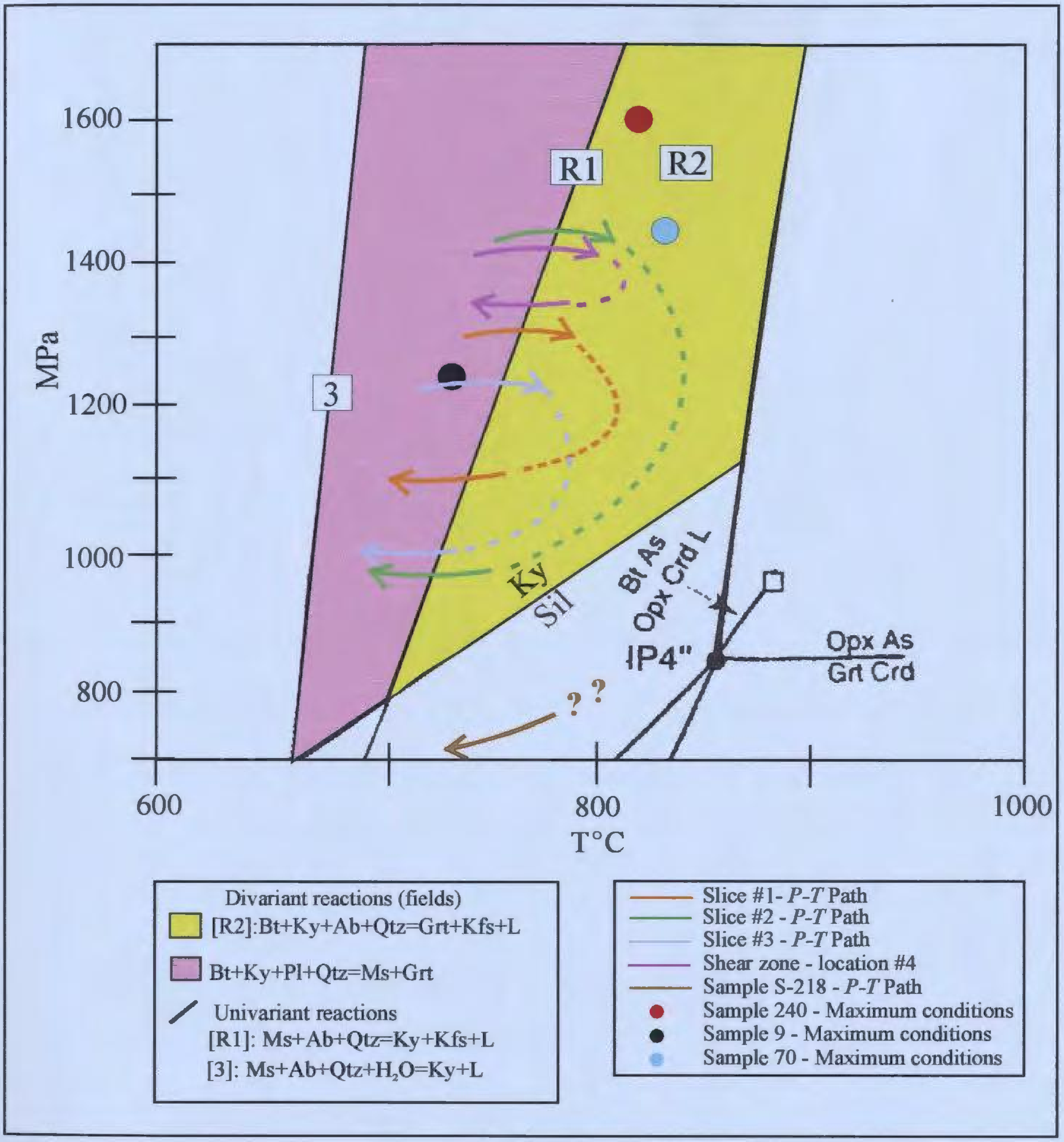


Figure 9.1: *P-T* diagram showing the *P-T* paths for samples from thrust slices #1- #3 and location #4 in the SW Gagnon terrane and for sample S-218 from the Lac Audréa area. Also shown are the maximum conditions for studied samples in the Lac Opocopa area.

CHAPTER 10: REFERENCES

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APPENDIX 1: NUMBER AND TYPE OF ANALYSES

Table 1.1: Summary of the number and type of analyses performed on each sample from the SW Gagnon terrane. T1-T4 are different microtextural settings: T1 = grains included in garnet, T2= grains in contact with garnet, T3 = grains adjacent to garnet and T4 = grains isolated from garnet in the matrix.

Slice / location	Sample		Bulk	Garnet		Biotite				Plagioclase/Feldspar				Muscovite
				Traverses	Maps	T1	T2	T3	T4	T1	T2	T3	T4	
#1	100		yes	2 grains with 1 traverse: Grs, Prp, Alm, Sps, Ti, Sc, P, Cr, Y	Garnet II: Ca, Fe, Mg, Cr, P, Y	0	9	9	40	5	0	1	4	6
#2	11	E1	yes	1 grain with 2 traverses: Grs, Prp, Alm, Sps, Ti, Sc, P, Cr, Y	Ca, Fe, Mg	0	8	12	12	1	2	3	9	0
		E2	yes	1 grain with 2 traverses: Grs, Prp, Alm, Sps, Ti, Sc, P, Cr, Y	Ca, Fe, Mg	0	11	9	11	0	6	5	13	0
	31A		yes	1 relict grain with 2 traverses: Grs, Prp, Alm, Sps	none	none				none				8
#3	207		yes	1 grain with 2 traverses: Grs, Prp, Alm, Sps, Ti, Sc, P, Cr, Y	Ca, Fe, Mg, K, Na, Al	0	3	3	15	4	8	0	7	0
	208		yes	1 grain with 2 traverses: Grs, Prp, Alm, Sps, Ti, Sc, P, Cr, Y	none	0	7	2	12	0	2	4	7	7
	282		yes	2 grains with 2 traverses across Garnet I and one traverse across Garnet II: Grs, Prp, Alm, Sps, Ti, Sc, P, Cr, Y	Garnet I: Ca, Fe, Mg	6	4	7	20	0	0	0	0	0
#4	288		yes	2 grains with 2 traverses: Grs, Prp, Alm, Sps, Ti, Sc, P, Cr, Y	none	13	1	5	43	0	2	1	7	0

Table 1.2: Summary of the number and type of analyses performed on each sample from the Lac Opocopa and Lac Audréa areas. T1-T4 are different microtextural settings: T1 = grains included in garnet, T2 = grains in contact with garnet, T3 = grains adjacent to garnet and T4 = grains isolated from garnet in the matrix.

Slice / location	Sample	Bulk	Garnet		Biotite				Plagioclase/Feldspar				Muscovite
			Traverses	Maps	T1	T2	T3	T4	T1	T2	T3	T4	
Lac Opocopa	9	yes	1 grain with 1 traverse (Indares 1995): Grs, Prp, Alm, Sps; 2 grains with 2 traverses: Ti, Sc, P, Cr, Y	Garnet I: Ca, Fe, Mn	Indares (1995)				Indares (1995)				None
	70	yes	1 grain with 1 traverse (Indares 1995): Grs, Prp, Alm, Sps; 2 grains with 2 traverses across Garnet I and 1 traverse across Garnet II: Ti, Sc, P, Cr, Y	2 grains: Ca, Fe, Mg	Indares (1995)				Indares (1995)				None
	240	yes	1 grain with 1 traverse (Indares 1995): Grs, Prp, Alm, Sps; 2 grains with 2 traverses: Ti, Sc, P, Cr, Y	2 grains: Ca, Fe, Mg	Indares (1995)				Indares (1995)				None
Lac Audréa	S-218	yes	1 grain with 1 traverse (Schwarz 1998): Grs, Prp, Alm, Sps; 1 grain with 2 traverses: Ti, Sc, P, Cr, Y	Ca, Fe, Mg	Schwarz (1998)				0	0	0	14	None

APPENDIX 2: BULK COMPOSITIONS OF THE STUDIED SAMPLES

Table 2.1: Bulk composition of samples from the SW Gagnon terrane.

Slice/ location	#1	#2			#3			#4	
Sample	*100*	*207*	*208*	*282*	*11E1*	*11E2*	*31*	*287*	*288*
SiO_2	64.34	64.25	65.88	64.64	64.39	63.22	66.09	65.89	78.64
Al_2O_3	16.66	15.68	15.63	14.21	17.43	16.07	15.96	16.02	13.37
MgO	1.99	2.40	2.34	2.81	3.00	2.05	2.20	1.26	0.48
FeO	7.07	9.13	8.42	11.26	6.36	3.93	4.73	3.63	1.80
MnO	0.17	0.19	0.34	0.13	0.11	0.01	0.28	0.00	0.09
TiO_2	0.89	0.61	0.86	2.01	0.69	0.45	0.80	0.52	0.21
CaO	2.31	2.21	1.08	1.37	0.63	1.94	1.29	0.31	2.68
Na_2O	2.46	1.61	0.67	0.49	3.89	5.56	1.80	2.12	2.69
K_2O	3.82	2.44	4.04	2.55	1.76	1.05	4.34	9.21	0.68
Total	*99.71*	*98.51*	*99.26*	*99.47*	*98.26*	*94.28*	*97.49*	*98.96*	*100.64*
X_{Mg}	0.33	0.34	0.33	0.31	0.46	0.48	0.45	0.38	0.32
Ca/(Ca+Na)	0.34	0.43	0.47	0.61	0.08	0.16	0.28	0.45	0.35

Table 2.2: Bulk composition of samples from the eastern Gagnon terrane. (b.d. = below detection)

Location	Lac Audréa	Lac Opocopa		
Sample	*S-218*	*9*	*70*	*240*
SiO_2	52.80	61.07	57.78	63.85
Al_2O_3	20.78	18.31	15.18	16.09
MgO	6.81	2.91	2.48	2.37
FeO	10.23	7.77	7.99	4.97
MnO	0.11	0.26	0.13	b.d.
TiO_2	1.09	0.58	0.57	0.47
CaO	1.41	1.27	1.46	2.29
Na_2O	1.85	4.53	1.92	5.61
K_2O	4.07	1.75	2.08	0.84
Total	*99.30*	*98.45*	*89.60*	*96.49*
X_{Mg}	0.54	0.40	0.36	0.46
Ca/(Ca+Na)	0.47	0.24	0.45	0.31

APPENDIX 3: GARNET ANALYSES

Table 3.1a: Composition of Garnet I from sample 100 as analyzed along traverse A-B (Plate 4.4). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	31.70	4.80	3.64	1.67	21.71	37.53	0.00	101.06	2.09	0.56	0.31	0.11	2.01	2.95	0.00	8.04	0.68	0.18	0.10	0.04	0.79	0.21
2	48	32.10	4.73	3.84	1.72	21.78	37.83	0.00	102.01	2.10	0.55	0.32	0.11	2.01	2.95	0.00	8.04	0.68	0.18	0.10	0.04	0.79	0.21
3	96	31.98	4.92	4.15	1.49	21.79	37.88	0.00	102.21	2.08	0.57	0.35	0.10	2.00	2.95	0.00	8.05	0.67	0.18	0.11	0.03	0.78	0.22
4	144	31.82	4.81	3.84	1.68	21.31	37.55	0.00	101.00	2.10	0.57	0.32	0.11	1.98	2.96	0.00	8.05	0.68	0.18	0.10	0.04	0.79	0.21
5	192	32.02	5.17	3.25	1.47	21.89	37.66	0.00	101.47	2.10	0.60	0.27	0.10	2.02	2.95	0.00	8.04	0.68	0.20	0.09	0.03	0.78	0.22
6	240	32.38	5.20	3.43	1.52	21.61	38.11	0.00	102.25	2.11	0.60	0.29	0.10	1.98	2.97	0.00	8.04	0.68	0.19	0.09	0.03	0.78	0.22
7	288	31.59	4.74	4.04	1.52	21.58	37.33	0.03	100.80	2.09	0.56	0.34	0.10	2.01	2.95	0.00	8.05	0.68	0.18	0.11	0.03	0.79	0.21
8	336	30.85	4.55	5.21	1.63	21.51	37.23	0.01	100.99	2.04	0.54	0.44	0.11	2.00	2.94	0.00	8.06	0.65	0.17	0.14	0.03	0.79	0.21
9	384	29.49	4.53	6.52	1.33	21.84	37.81	0.13	101.53	1.92	0.53	0.55	0.09	2.01	2.95	0.01	8.04	0.62	0.17	0.18	0.03	0.78	0.22
10	432	28.39	4.37	7.34	1.25	21.60	37.72	0.08	100.67	1.86	0.51	0.62	0.08	2.00	2.96	0.00	8.04	0.61	0.17	0.20	0.03	0.78	0.22
11	480	28.39	4.69	7.01	1.11	21.88	37.91	0.00	100.98	1.85	0.55	0.59	0.07	2.01	2.96	0.00	8.03	0.61	0.18	0.19	0.02	0.77	0.23
12	528	28.11	4.91	7.06	1.38	21.97	38.20	0.00	101.62	1.82	0.57	0.59	0.09	2.01	2.96	0.00	8.03	0.59	0.19	0.19	0.03	0.76	0.24
13	576	29.04	5.24	6.85	1.28	21.99	37.93	0.06	102.32	1.88	0.60	0.57	0.08	2.00	2.93	0.00	8.07	0.60	0.19	0.18	0.03	0.76	0.24
14	624	28.64	5.03	6.63	1.40	21.96	37.77	0.00	101.43	1.87	0.58	0.55	0.09	2.02	2.94	0.00	8.05	0.60	0.19	0.18	0.03	0.76	0.24
15	672	28.70	5.30	6.51	1.39	22.02	38.43	0.00	102.35	1.85	0.61	0.54	0.09	2.00	2.96	0.00	8.04	0.60	0.20	0.17	0.03	0.75	0.25
16	720	29.20	5.51	5.74	1.21	21.71	38.24	0.00	101.61	1.89	0.64	0.48	0.08	1.99	2.97	0.00	8.04	0.61	0.21	0.15	0.03	0.75	0.25
17	768	30.29	5.99	3.78	1.35	21.86	37.59	0.07	100.86	1.98	0.70	0.32	0.09	2.02	2.94	0.00	8.05	0.64	0.23	0.10	0.03	0.74	0.26
18	816	29.24	5.84	4.82	1.26	21.96	38.04	0.13	101.15	1.90	0.68	0.40	0.08	2.01	2.96	0.01	8.04	0.62	0.22	0.13	0.03	0.74	0.26
19	864	29.11	5.42	5.80	1.57	21.93	37.93	0.07	101.76	1.89	0.63	0.48	0.10	2.01	2.94	0.00	8.05	0.61	0.20	0.16	0.03	0.75	0.25
20	912	29.17	5.45	5.93	1.27	22.03	38.15	0.03	102.01	1.89	0.63	0.49	0.08	2.01	2.95	0.00	8.05	0.61	0.20	0.16	0.03	0.75	0.25
21	960	29.13	5.42	5.97	1.46	21.90	38.46	0.00	102.33	1.88	0.62	0.49	0.10	1.99	2.96	0.00	8.04	0.61	0.20	0.16	0.03	0.75	0.25
22	1008	28.77	5.36	5.91	1.35	21.75	37.95	0.04	101.08	1.88	0.62	0.49	0.09	2.00	2.96	0.00	8.04	0.61	0.20	0.16	0.03	0.75	0.25
23	1056	29.05	5.46	5.69	1.29	21.93	37.69	0.01	101.13	1.90	0.64	0.48	0.09	2.02	2.94	0.00	8.05	0.61	0.21	0.15	0.03	0.75	0.25
24	1104	28.80	5.51	5.76	1.22	22.11	38.24	0.00	101.65	1.86	0.64	0.48	0.08	2.02	2.96	0.00	8.03	0.61	0.21	0.16	0.03	0.75	0.25
25	1152	28.94	5.56	5.59	1.44	21.96	37.81	0.00	101.30	1.88	0.65	0.47	0.10	2.01	2.94	0.00	8.05	0.61	0.21	0.15	0.03	0.74	0.26
27	1248	29.35	5.84	5.52	1.40	22.03	38.46	0.03	102.59	1.89	0.67	0.45	0.09	1.99	2.95	0.00	8.05	0.61	0.22	0.15	0.03	0.74	0.26

28	1296	29.13	6.02	5.13	1.37	22.03	38.01	0.03	101.69	1.89	0.69	0.43	0.09	2.01	2.94	0.00	8.05	0.61	0.22	0.14	0.03	0.73	0.27
29	1344	28.86	6.11	4.52	1.51	21.69	37.78	0.00	100.48	1.89	0.71	0.38	0.10	2.00	2.96	0.00	8.04	0.61	0.23	0.12	0.03	0.73	0.27
30	1392	29.43	6.17	4.77	1.31	22.36	38.56	0.00	102.61	1.89	0.70	0.39	0.09	2.02	2.95	0.00	8.04	0.61	0.23	0.13	0.03	0.73	0.27
31	1440	29.05	6.11	5.17	1.45	22.18	38.14	0.00	102.09	1.87	0.70	0.43	0.09	2.02	2.94	0.00	8.05	0.60	0.23	0.14	0.03	0.73	0.27
32	1488	29.45	5.93	4.97	1.35	22.04	38.55	0.00	102.29	1.89	0.68	0.41	0.09	2.00	2.97	0.00	8.04	0.62	0.22	0.13	0.03	0.74	0.26
33	1536	29.13	6.16	5.12	1.49	22.26	38.54	0.00	102.70	1.87	0.70	0.42	0.10	2.01	2.95	0.00	8.04	0.60	0.23	0.14	0.03	0.73	0.27
34	1584	28.94	6.21	5.19	1.26	21.87	38.29	0.00	101.76	1.87	0.71	0.43	0.08	1.99	2.96	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
35	1632	29.28	6.14	5.39	1.28	21.95	38.19	0.03	102.24	1.89	0.71	0.45	0.08	1.99	2.94	0.00	8.06	0.60	0.23	0.14	0.03	0.73	0.27
36	1680	29.08	5.88	5.23	1.43	21.82	38.18	0.00	101.62	1.89	0.68	0.43	0.09	1.99	2.96	0.00	8.04	0.61	0.22	0.14	0.03	0.74	0.26
37	1728	29.51	6.03	4.94	1.18	22.18	38.69	0.04	102.53	1.89	0.69	0.41	0.08	2.00	2.97	0.00	8.03	0.62	0.22	0.13	0.02	0.73	0.27
38	1776	28.88	6.19	5.23	1.31	21.87	37.75	0.08	101.21	1.88	0.72	0.44	0.09	2.01	2.94	0.00	8.06	0.60	0.23	0.14	0.03	0.72	0.28
39	1824	28.89	6.36	4.96	1.29	22.54	38.62	0.00	102.66	1.84	0.72	0.41	0.08	2.03	2.95	0.00	8.04	0.60	0.24	0.13	0.03	0.72	0.28
40	1872	28.72	6.41	4.80	1.39	22.06	38.02	0.03	101.40	1.86	0.74	0.40	0.09	2.01	2.94	0.00	8.05	0.60	0.24	0.13	0.03	0.72	0.28
41	1920	28.64	6.24	5.46	1.20	22.25	38.39	0.04	102.19	1.84	0.71	0.45	0.08	2.01	2.95	0.00	8.04	0.60	0.23	0.15	0.03	0.72	0.28
42	1968	28.76	6.36	5.40	1.31	22.27	38.20	0.03	102.29	1.85	0.73	0.44	0.08	2.02	2.94	0.00	8.06	0.60	0.23	0.14	0.03	0.72	0.28
43	2016	28.65	6.14	5.36	1.21	22.13	38.28	0.00	101.77	1.85	0.71	0.44	0.08	2.01	2.95	0.00	8.04	0.60	0.23	0.14	0.03	0.72	0.28
45	2112	28.81	5.93	5.07	1.33	22.06	38.08	0.00	101.29	1.87	0.69	0.42	0.09	2.02	2.95	0.00	8.04	0.61	0.22	0.14	0.03	0.73	0.27
46	2160	28.99	5.96	4.88	1.28	22.19	38.06	0.10	101.35	1.88	0.69	0.41	0.08	2.03	2.95	0.01	8.04	0.61	0.23	0.13	0.03	0.73	0.27
47	2208	28.74	6.25	4.76	1.48	21.89	37.69	0.00	100.81	1.88	0.73	0.40	0.10	2.01	2.94	0.00	8.05	0.61	0.23	0.13	0.03	0.72	0.28
48	2256	28.88	6.36	4.83	1.49	22.12	38.11	0.06	101.80	1.86	0.73	0.40	0.10	2.01	2.94	0.00	8.05	0.60	0.24	0.13	0.03	0.72	0.28
49	2304	28.10	6.12	4.88	1.38	22.31	38.45	0.01	101.24	1.81	0.70	0.40	0.09	2.03	2.97	0.00	8.01	0.60	0.23	0.13	0.03	0.72	0.28
50	2352	28.91	6.12	5.07	1.29	22.08	38.40	0.03	101.88	1.86	0.70	0.42	0.08	2.01	2.96	0.00	8.04	0.61	0.23	0.14	0.03	0.73	0.27
52	2448	29.25	6.24	4.54	1.27	22.05	38.34	0.00	101.69	1.89	0.72	0.38	0.08	2.01	2.96	0.00	8.04	0.62	0.23	0.12	0.03	0.72	0.28
53	2496	29.94	6.37	3.76	1.34	21.82	37.51	0.05	100.74	1.96	0.74	0.32	0.09	2.01	2.94	0.00	8.06	0.63	0.24	0.10	0.03	0.73	0.27
61	2880	29.84	6.23	4.44	1.35	21.82	38.15	0.00	101.84	1.93	0.72	0.37	0.09	1.99	2.95	0.00	8.05	0.62	0.23	0.12	0.03	0.73	0.27
62	2928	29.47	6.11	4.90	1.24	22.04	38.22	0.00	101.98	1.90	0.70	0.41	0.08	2.01	2.95	0.00	8.05	0.62	0.23	0.13	0.03	0.73	0.27
63	2976	29.10	6.02	5.21	1.42	22.12	38.03	0.07	101.91	1.88	0.69	0.43	0.09	2.02	2.94	0.00	8.05	0.61	0.22	0.14	0.03	0.73	0.27
64	3024	29.03	6.13	5.18	1.38	22.10	38.24	0.00	102.06	1.87	0.70	0.43	0.09	2.01	2.95	0.00	8.05	0.60	0.23	0.14	0.03	0.73	0.27
65	3072	29.04	6.03	5.17	1.29	22.01	37.94	0.08	101.48	1.88	0.70	0.43	0.08	2.01	2.94	0.00	8.05	0.61	0.23	0.14	0.03	0.73	0.27
69	3264	28.85	5.90	5.33	1.29	21.86	38.15	0.00	101.38	1.87	0.68	0.44	0.09	2.00	2.96	0.00	8.04	0.61	0.22	0.14	0.03	0.73	0.27
70	3312	28.81	5.96	5.37	1.30	21.48	37.77	0.00	100.69	1.89	0.70	0.45	0.09	1.98	2.96	0.00	8.05	0.60	0.22	0.14	0.03	0.73	0.27
71	3360	28.50	6.15	3.12	1.42	22.72	36.82	0.00	98.99	1.89	0.73	0.26	0.10	2.12	2.92	0.00	8.04	0.63	0.24	0.09	0.03	0.72	0.28

72	3408	29.40	6.25	5.01	1.21	22.09	37.97	0.00	101.93	1.90	0.72	0.41	0.08	2.01	2.93	0.00	8.06	0.61	0.23	0.13	0.03	0.73	0.27
73	3456	29.59	6.16	3.89	1.28	21.93	38.65	0.00	101.50	1.91	0.71	0.32	0.08	2.00	2.99	0.00	8.01	0.63	0.23	0.11	0.03	0.73	0.27
74	3504	29.21	6.00	5.18	1.30	22.13	38.48	0.06	102.30	1.88	0.69	0.43	0.08	2.01	2.96	0.00	8.04	0.61	0.22	0.14	0.03	0.73	0.27
75	3552	28.74	6.02	5.47	1.40	22.26	38.48	0.01	102.37	1.84	0.69	0.45	0.09	2.01	2.95	0.00	8.04	0.60	0.22	0.15	0.03	0.73	0.27
77	3648	29.11	6.00	5.47	1.35	21.70	37.81	0.01	101.43	1.89	0.70	0.46	0.09	1.99	2.94	0.00	8.06	0.60	0.22	0.15	0.03	0.73	0.27
78	3696	28.78	5.87	5.38	1.40	21.97	37.92	0.00	101.32	1.87	0.68	0.45	0.09	2.01	2.95	0.00	8.05	0.61	0.22	0.14	0.03	0.73	0.27
79	3744	28.76	5.79	5.29	1.27	21.98	37.64	0.01	100.73	1.88	0.67	0.44	0.08	2.02	2.94	0.00	8.05	0.61	0.22	0.14	0.03	0.74	0.26
80	3792	29.33	5.75	5.14	1.42	22.11	38.20	0.06	101.95	1.90	0.66	0.43	0.09	2.01	2.95	0.00	8.04	0.62	0.22	0.14	0.03	0.74	0.26
81	3840	29.72	5.80	5.38	1.22	21.93	38.21	0.01	102.26	1.92	0.67	0.44	0.08	1.99	2.95	0.00	8.05	0.62	0.21	0.14	0.03	0.74	0.26
82	3888	29.72	5.82	5.24	1.20	21.97	37.76	0.04	101.71	1.93	0.67	0.44	0.08	2.01	2.93	0.00	8.06	0.62	0.22	0.14	0.03	0.74	0.26
83	3936	29.46	6.04	5.10	1.21	21.78	38.05	0.00	101.64	1.91	0.70	0.42	0.08	1.99	2.95	0.00	8.05	0.61	0.22	0.14	0.03	0.73	0.27
84	3984	29.43	5.64	5.11	1.38	21.73	38.07	0.04	101.36	1.92	0.65	0.43	0.09	1.99	2.96	0.00	8.04	0.62	0.21	0.14	0.03	0.75	0.25
85	4032	29.28	5.71	5.32	1.45	21.55	37.62	0.00	100.94	1.92	0.67	0.45	0.10	1.99	2.94	0.00	8.06	0.61	0.21	0.14	0.03	0.74	0.26
86	4080	29.21	5.66	5.29	1.34	21.79	38.17	0.09	101.46	1.90	0.66	0.44	0.09	1.99	2.96	0.01	8.04	0.62	0.21	0.14	0.03	0.74	0.26
87	4128	29.41	5.64	5.53	1.39	21.85	38.16	0.04	101.98	1.90	0.65	0.46	0.09	1.99	2.95	0.00	8.05	0.61	0.21	0.15	0.03	0.75	0.25
88	4176	29.75	5.40	5.58	1.24	21.85	38.05	0.00	101.87	1.93	0.62	0.46	0.08	2.00	2.95	0.00	8.05	0.62	0.20	0.15	0.03	0.76	0.24
89	4224	30.27	5.36	4.64	1.54	22.10	37.87	0.00	101.78	1.97	0.62	0.39	0.10	2.02	2.94	0.00	8.04	0.64	0.20	0.13	0.03	0.76	0.24
90	4272	30.95	5.50	4.40	1.48	21.86	37.94	0.01	102.14	2.01	0.64	0.37	0.10	2.00	2.95	0.00	8.05	0.65	0.20	0.12	0.03	0.76	0.24
92	4368	30.56	5.28	5.09	1.54	22.14	38.04	0.09	102.64	1.97	0.61	0.42	0.10	2.02	2.94	0.01	8.05	0.64	0.20	0.14	0.03	0.76	0.24
93	4416	30.34	5.25	5.09	1.43	22.01	38.11	0.00	102.23	1.96	0.61	0.42	0.09	2.01	2.95	0.00	8.05	0.64	0.20	0.14	0.03	0.76	0.24
94	4464	30.00	5.32	5.11	1.45	21.74	37.71	0.00	101.32	1.96	0.62	0.43	0.10	2.00	2.95	0.00	8.05	0.63	0.20	0.14	0.03	0.76	0.24
95	4512	28.25	4.94	4.53	1.17	21.21	37.02	0.00	97.62	1.91	0.59	0.39	0.08	2.02	2.99	0.00	8.03	0.64	0.20	0.13	0.03	0.76	0.24
96	4560	30.15	4.94	5.73	1.44	21.86	37.56	0.00	101.68	1.97	0.57	0.48	0.10	2.01	2.93	0.00	8.06	0.63	0.18	0.15	0.03	0.77	0.23
97	4608	30.02	4.90	6.06	1.12	21.60	37.77	0.23	101.45	1.96	0.57	0.51	0.07	1.99	2.95	0.01	8.05	0.63	0.18	0.16	0.02	0.77	0.23
98	4656	29.84	4.90	6.17	1.39	21.96	37.65	0.00	101.90	1.94	0.57	0.51	0.09	2.01	2.93	0.00	8.06	0.62	0.18	0.17	0.03	0.77	0.23
100	4752	32.25	4.31	4.22	1.71	21.60	37.25	0.12	101.34	2.13	0.51	0.36	0.11	2.01	2.94	0.01	8.06	0.69	0.16	0.11	0.04	0.81	0.19

Table 3.1b: Qualitative trace element analyses of Garnet I from sample 100 along traverse A-B (Plate 4.4). Relative concentrations are measured in counts/second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P
1	0	1358	2391	2155	1166	3706	66	2080	1309	2422	2071	1170	3490	123	3904	1341	2440	2203	1145	3458
2	32	1340	2558	2312	1205	3427	67	2112	1375	2405	2081	1151	3494	124	3936	1373	2525	2231	1210	3641
3	64	1323	2425	2171	1183	3626	77	2432	1282	2392	2199	1201	3620	126	4000	1086	2526	2271	940	3706
4	96	1369	2540	2162	1231	3531	78	2464	1337	2446	2149	1110	3713	127	4032	1364	2453	2224	1200	3707
5	128	1383	2391	2219	1129	3547	79	2496	1340	2432	2194	1181	3644	128	4064	1349	2500	2224	1260	3495
6	160	1391	2447	2099	1217	3606	80	2528	1374	2530	2134	1179	3581	129	4096	1332	2329	2276	1234	3226
7	192	1318	2472	2084	1145	3719	81	2560	1050	1761	1636	889	3621	131	4160	1288	2333	2158	1150	3280
9	224	1367	2380	2253	1184	3591	82	2592	1041	1709	1538	884	3301	132	4192	1387	2373	2190	1243	3447
10	288	1327	2437	2223	1188	3768	83	2624	1414	2429	2154	1198	3546	133	4224	1249	2246	2078	1108	3381
12	352	1344	2420	2168	1214	3573	84	2656	1439	2499	2147	1203	3583	134	4256	1340	2433	2241	1176	3453
13	384	1412	2417	2187	1233	3657	85	2688	1372	2364	2155	1157	3603	135	4288	1357	2463	2241	1205	3623
14	416	1339	2497	2222	1174	3791	86	2720	1402	2348	2235	1172	3552	136	4320	1356	2483	2306	1137	3517
15	448	1416	2436	2262	1163	3931	88	2784	1333	2394	2184	1139	3472	137	4352	1338	2502	2432	1183	3621
16	480	1303	2427	2325	1200	3911	89	2816	1383	2508	2068	1162	3471	138	4384	1372	2489	2121	1230	3641
17	512	1322	2411	2312	1147	3887	90	2848	1265	2201	1926	1049	3084	139	4416	1386	2502	2254	1225	3635
18	544	1355	2413	2165	1203	3623	91	2880	1342	2434	2244	1182	3474	140	4448	1366	2358	2175	1163	3577
19	576	1266	2456	2233	1177	3898	92	2912	1252	2288	1945	1090	3049	141	4480	1327	2472	2205	1193	3764
20	608	1354	2448	2228	1185	3870	94	2976	1286	2423	2072	1198	3488	142	4512	1338	2492	2207	1169	3714
21	640	1353	2459	2037	1234	3761	95	3008	1393	2494	2164	1202	3547	143	4544	1327	2377	2365	1183	3589
22	672	1356	2459	2081	1125	3713	96	3040	1343	2392	2309	1133	3523	144	4576	1568	2397	2287	1194	3643
23	704	1354	2473	2154	1181	3366	97	3072	1290	2649	2200	1141	3436	145	4608	1350	2271	2271	1191	3682
24	736	1353	2314	1981	1138	3308	98	3104	1323	2405	2139	1229	3533	146	4640	1414	2401	2310	1190	3752
25	768	1350	2439	2212	1208	3613	99	3136	1335	2412	2122	1075	3389	147	4672	1438	2390	2253	1154	3732
26	800	1333	2605	2188	1220	3433	100	3168	1327	2441	2169	1136	3563	148	4704	1402	2396	2269	1152	3663
32	992	1303	2439	2234	1139	3579	101	3200	1402	2454	2227	1127	3578	149	4736	1463	2449	2254	1231	3855
33	1024	1328	2450	2143	1204	3387	102	3232	1435	2473	2212	1184	3633	150	4768	1408	2426	2279	1113	3689
34	1056	1309	2507	2228	1166	3401	103	3264	1348	2385	2242	1114	3471							
45	1408	1283	2427	2151	1128	3464	104	3296	1363	2387	2266	1176	3417							
46	1440	1388	2531	2252	1249	3427	105	3328	1256	2438	2099	1213	3471							
47	1472	1338	2425	2121	1244	3469	106	3360	1340	2518	2209	1165	3468							
48	1504	1300	2468	2214	1161	3292	107	3392	1324	2521	2252	1224	3409							
49	1536	1339	2420	2193	1189	3479	110	3488	1322	2539	2200	1249	3336							
50	1568	1368	2408	2369	1132	3633	111	3520	1278	2426	2166	1164	3472							
51	1600	1370	2428	2318	1195	3340	112	3552	1333	2442	2104	1171	3682							
52	1632	1384	2467	2176	1216	3599	113	3584	1355	2418	2272	1171	3527							
53	1664	1398	2416	2200	1185	3565	114	3616	1357	2443	2185	1185	3573							
54	1696	1349	2367	2193	1185	3502	115	3648	1411	2499	2168	1188	3599							
55	1728	1399	2456	2161	1163	3458	116	3680	1357	2444	2204	1190	3676							
58	1824	1368	2421	2172	1202	3598	117	3712	1325	2476	2137	1174	3505							
59	1856	1368	2416	2205	1187	3653	118	3744	1314	2384	2172	1237	3413							
60	1888	1344	2424	2192	1170	3793	119	3776	1305	2299	2106	1186	3099							
61	1920	1342	2354	2149	1183	3777	120	3808	1319	2375	2137	1178	3463							
62	1952	1329	2297	2246	1168	3613	121	3840	1395	2492	2121	1167	3385							
64	2016	1349	2350	2329	1144	3507	122	3872	1359	2529	2113	1238	3251							

Table 3.2a: Composition of Garnet II from sample 100 as analyzed along traverse A-B (Plate 4.5). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12(O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
2	52	31.06	4.36	5.01	1.49	21.51	37.59	0.01	101.02	2.05	0.51	0.42	0.10	2.00	2.96	0.00	8.04	0.66	0.17	0.14	0.03	0.80	0.20
3	104	30.83	4.65	4.91	1.40	21.73	37.66	0.00	101.18	2.02	0.54	0.41	0.09	2.01	2.96	0.00	8.04	0.66	0.18	0.13	0.03	0.79	0.21
4	156	31.06	4.66	4.98	1.53	21.63	37.61	0.00	101.47	2.04	0.54	0.42	0.10	2.00	2.95	0.00	8.05	0.66	0.18	0.13	0.03	0.79	0.21
5	208	31.02	5.05	4.39	1.34	22.02	37.85	0.03	101.67	2.02	0.59	0.37	0.09	2.02	2.95	0.00	8.04	0.66	0.19	0.12	0.03	0.78	0.22
7	312	31.34	5.21	4.37	1.42	21.83	37.57	0.01	101.74	2.05	0.61	0.37	0.09	2.01	2.93	0.00	8.06	0.66	0.19	0.12	0.03	0.77	0.23
8	364	30.81	5.12	4.45	1.31	21.76	37.85	0.08	101.29	2.01	0.60	0.37	0.09	2.01	2.96	0.00	8.04	0.66	0.19	0.12	0.03	0.77	0.23
9	416	31.32	5.25	4.27	1.41	21.93	37.81	0.13	101.99	2.04	0.61	0.36	0.09	2.01	2.94	0.01	8.05	0.66	0.20	0.12	0.03	0.77	0.23
10	468	31.50	5.49	3.96	1.48	21.79	37.94	0.00	102.17	2.05	0.64	0.33	0.10	2.00	2.95	0.00	8.05	0.66	0.20	0.11	0.03	0.76	0.24
11	520	31.33	5.62	3.31	1.59	21.77	37.60	0.00	101.23	2.05	0.66	0.28	0.11	2.01	2.95	0.00	8.05	0.66	0.21	0.09	0.03	0.76	0.24
12	576	31.09	5.77	3.49	1.51	22.01	37.85	0.00	101.72	2.02	0.67	0.29	0.10	2.02	2.95	0.00	8.05	0.66	0.22	0.09	0.03	0.75	0.25
13	624	32.15	5.10	3.42	1.58	22.14	37.66	0.00	102.05	2.10	0.59	0.29	0.10	2.03	2.94	0.00	8.05	0.68	0.19	0.09	0.03	0.78	0.22
15	728	31.82	5.62	3.56	1.41	21.83	37.98	0.00	102.22	2.07	0.65	0.30	0.09	2.00	2.95	0.00	8.05	0.67	0.21	0.10	0.03	0.76	0.24
16	780	31.22	5.57	3.92	1.47	21.89	37.77	0.07	101.85	2.03	0.65	0.33	0.10	2.01	2.94	0.00	8.05	0.65	0.21	0.11	0.03	0.76	0.24
19	936	31.17	5.84	3.97	1.56	22.03	37.92	0.00	102.50	2.02	0.67	0.33	0.10	2.01	2.93	0.00	8.06	0.65	0.22	0.11	0.03	0.75	0.25
21	1040	30.93	5.67	4.15	1.34	21.77	38.07	0.03	101.94	2.01	0.66	0.35	0.09	1.99	2.96	0.00	8.05	0.65	0.21	0.11	0.03	0.75	0.25
23	1144	30.85	5.90	4.48	1.56	21.79	37.86	0.00	102.44	2.00	0.68	0.37	0.10	1.99	2.93	0.00	8.07	0.63	0.22	0.12	0.03	0.75	0.25
24	1196	30.36	5.52	4.34	1.55	21.83	38.16	0.02	101.77	1.97	0.64	0.36	0.10	2.00	2.96	0.00	8.04	0.64	0.21	0.12	0.03	0.76	0.24
25	1248	30.46	5.82	4.38	1.55	22.11	37.83	0.00	102.14	1.97	0.67	0.36	0.10	2.02	2.93	0.00	8.06	0.63	0.22	0.12	0.03	0.75	0.25
26	1300	30.65	5.94	4.23	1.48	21.85	38.10	0.15	102.26	1.98	0.69	0.35	0.10	1.99	2.95	0.01	8.06	0.64	0.22	0.11	0.03	0.74	0.26
27	1352	30.00	5.68	4.13	1.51	21.53	37.76	0.00	100.62	1.97	0.66	0.35	0.10	1.99	2.96	0.00	8.04	0.64	0.22	0.11	0.03	0.75	0.25
29	1456	30.32	6.04	3.96	1.49	22.19	38.52	0.08	102.52	1.95	0.69	0.33	0.10	2.01	2.96	0.00	8.03	0.64	0.23	0.11	0.03	0.74	0.26
30	1508	30.23	6.04	4.09	1.38	21.97	38.17	0.02	101.88	1.96	0.70	0.34	0.09	2.00	2.95	0.00	8.04	0.63	0.23	0.11	0.03	0.74	0.26
31	1560	30.16	5.90	4.01	1.54	21.97	37.70	0.06	101.27	1.97	0.69	0.33	0.10	2.02	2.94	0.00	8.05	0.64	0.22	0.11	0.03	0.74	0.26
33	1664	30.10	5.97	4.10	1.59	22.32	38.77	0.08	102.83	1.93	0.68	0.34	0.10	2.01	2.97	0.00	8.03	0.63	0.22	0.11	0.03	0.74	0.26
34	1716	29.89	5.75	4.00	1.48	21.32	37.68	0.00	100.10	1.97	0.68	0.34	0.10	1.98	2.97	0.00	8.04	0.64	0.22	0.11	0.03	0.74	0.26
35	1768	30.01	5.84	4.15	1.59	21.90	37.78	0.09	101.26	1.96	0.68	0.35	0.11	2.01	2.95	0.01	8.05	0.63	0.22	0.11	0.03	0.74	0.26
36	1820	29.85	6.24	3.98	1.41	21.79	37.80	0.00	101.07	1.95	0.73	0.33	0.09	2.00	2.95	0.00	8.05	0.63	0.23	0.11	0.03	0.73	0.27
37	1872	30.19	6.24	4.04	1.53	21.54	37.90	0.08	101.44	1.97	0.72	0.34	0.10	1.98	2.95	0.00	8.06	0.63	0.23	0.11	0.03	0.73	0.27

38	1924	29.49	5.92	4.00	1.49	21.51	37.56	0.00	99.98	1.95	0.70	0.34	0.10	2.00	2.96	0.00	8.04	0.63	0.23	0.11	0.03	0.74	0.26
40	2028	29.97	6.17	4.13	1.51	22.02	38.45	0.03	102.24	1.93	0.71	0.34	0.10	2.00	2.96	0.00	8.04	0.63	0.23	0.11	0.03	0.73	0.27
41	2080	30.26	6.05	4.11	1.46	21.87	38.03	0.00	101.78	1.96	0.70	0.34	0.10	2.00	2.95	0.00	8.05	0.63	0.23	0.11	0.03	0.74	0.26
43	2184	29.83	6.34	4.17	1.56	22.36	38.34	0.01	102.61	1.91	0.72	0.34	0.10	2.02	2.94	0.00	8.05	0.62	0.24	0.11	0.03	0.73	0.27
44	2236	30.26	6.03	4.20	1.61	22.16	38.30	0.10	102.55	1.95	0.69	0.35	0.10	2.01	2.95	0.01	8.05	0.63	0.22	0.11	0.03	0.74	0.26
45	2288	29.51	6.02	4.15	1.34	21.59	37.26	0.00	99.87	1.95	0.71	0.35	0.09	2.01	2.94	0.00	8.05	0.63	0.23	0.11	0.03	0.73	0.27
48	2444	29.56	5.88	4.44	1.49	21.75	38.15	0.00	101.28	1.92	0.68	0.37	0.10	1.99	2.97	0.00	8.04	0.63	0.22	0.12	0.03	0.74	0.26
49	2496	29.74	6.09	4.23	1.57	22.02	38.54	0.00	102.18	1.92	0.70	0.35	0.10	2.00	2.97	0.00	8.03	0.62	0.23	0.11	0.03	0.73	0.27
56	2860	27.95	6.12	4.61	1.40	22.74	37.83	0.01	100.64	1.82	0.71	0.38	0.09	2.08	2.94	0.00	8.02	0.61	0.24	0.13	0.03	0.72	0.28
57	2912	29.45	6.24	4.24	1.30	22.51	38.42	0.06	102.15	1.89	0.71	0.35	0.08	2.04	2.95	0.00	8.03	0.62	0.23	0.11	0.03	0.73	0.27
58	2964	30.11	6.01	3.99	1.54	21.63	37.60	0.00	100.88	1.97	0.70	0.34	0.10	2.00	2.95	0.00	8.06	0.63	0.23	0.11	0.03	0.74	0.26
59	3016	29.06	6.03	4.79	1.43	21.97	38.25	0.07	101.53	1.88	0.70	0.40	0.09	2.01	2.96	0.00	8.04	0.61	0.23	0.13	0.03	0.73	0.27
60	3068	29.29	6.02	4.97	1.50	21.96	37.72	0.04	101.47	1.90	0.70	0.41	0.10	2.01	2.93	0.00	8.06	0.61	0.22	0.13	0.03	0.73	0.27
61	3120	29.16	5.75	5.05	1.53	21.66	38.08	0.00	101.24	1.90	0.67	0.42	0.10	1.99	2.97	0.00	8.04	0.61	0.22	0.14	0.03	0.74	0.26
64	3276	30.28	6.10	3.56	1.47	21.54	37.70	0.00	100.66	1.99	0.71	0.30	0.10	1.99	2.96	0.00	8.05	0.64	0.23	0.10	0.03	0.74	0.26
65	3328	30.06	5.92	3.91	1.54	21.66	37.58	0.00	100.66	1.97	0.69	0.33	0.10	2.00	2.95	0.00	8.05	0.64	0.22	0.11	0.03	0.74	0.26
66	3380	30.27	6.12	3.82	1.54	21.48	37.50	0.07	100.73	1.99	0.72	0.32	0.10	1.99	2.95	0.00	8.06	0.64	0.23	0.10	0.03	0.74	0.26
67	3432	30.50	6.15	3.73	1.47	21.79	37.52	0.09	101.17	1.99	0.72	0.31	0.10	2.01	2.93	0.01	8.06	0.64	0.23	0.10	0.03	0.74	0.26
68	3484	28.83	5.53	3.51	1.40	22.48	37.49	0.01	99.40	1.90	0.65	0.30	0.09	2.09	2.96	0.00	8.01	0.65	0.22	0.10	0.03	0.75	0.25
69	3536	30.86	6.00	3.58	1.56	21.87	38.20	0.00	102.07	2.00	0.69	0.30	0.10	2.00	2.96	0.00	8.04	0.65	0.22	0.10	0.03	0.74	0.26
70	3588	30.52	6.29	3.44	1.43	21.81	37.97	0.15	101.46	1.99	0.73	0.29	0.09	2.00	2.95	0.01	8.05	0.64	0.24	0.09	0.03	0.73	0.27
82	4212	30.02	6.38	3.65	1.26	21.78	38.30	0.00	101.39	1.95	0.74	0.30	0.08	1.99	2.97	0.00	8.03	0.63	0.24	0.10	0.03	0.73	0.27
83	4264	30.57	6.26	4.11	1.37	21.96	38.05	0.06	102.32	1.97	0.72	0.34	0.09	2.00	2.94	0.00	8.06	0.63	0.23	0.11	0.03	0.73	0.27
87	4472	29.25	5.84	5.20	1.36	21.91	38.23	0.00	101.79	1.89	0.67	0.43	0.09	2.00	2.96	0.00	8.04	0.61	0.22	0.14	0.03	0.74	0.26
88	4524	29.70	6.24	5.28	1.32	21.96	38.00	0.00	102.50	1.91	0.72	0.44	0.09	1.99	2.93	0.00	8.07	0.61	0.23	0.14	0.03	0.73	0.27
89	4576	29.46	5.94	4.58	1.17	22.18	37.06	0.00	100.39	1.94	0.70	0.39	0.08	2.05	2.91	0.00	8.06	0.63	0.22	0.12	0.03	0.74	0.26
90	4628	29.62	5.87	5.00	1.18	21.74	37.95	0.00	101.36	1.93	0.68	0.42	0.08	1.99	2.95	0.00	8.05	0.62	0.22	0.13	0.03	0.74	0.26
91	4680	30.53	5.94	4.42	1.31	21.65	37.85	0.00	101.70	1.99	0.69	0.37	0.09	1.99	2.95	0.00	8.06	0.63	0.22	0.12	0.03	0.74	0.26
93	4782	30.30	5.92	4.22	1.51	21.80	38.03	0.00	101.76	1.97	0.68	0.35	0.10	1.99	2.95	0.00	8.05	0.63	0.22	0.11	0.03	0.74	0.26
95	4888	31.18	5.73	3.89	1.40	21.66	37.58	0.00	101.44	2.04	0.67	0.33	0.09	2.00	2.94	0.00	8.06	0.65	0.21	0.10	0.03	0.75	0.25
96	4940	30.61	5.51	4.08	1.59	21.94	38.12	0.00	101.85	1.99	0.64	0.34	0.10	2.01	2.96	0.00	8.04	0.65	0.21	0.11	0.03	0.76	0.24
97	4992	30.14	5.63	4.14	1.53	21.64	38.02	0.00	101.10	1.97	0.66	0.35	0.10	1.99	2.97	0.00	8.03	0.64	0.21	0.11	0.03	0.75	0.25
98	5044	30.86	5.29	4.11	1.38	21.40	37.62	0.02	100.65	2.03	0.62	0.35	0.09	1.99	2.96	0.00	8.04	0.66	0.20	0.11	0.03	0.77	0.23
99	5096	31.47	5.54	3.64	1.38	22.10	38.12	0.02	102.25	2.04	0.64	0.30	0.09	2.02	2.95	0.00	8.04	0.66	0.21	0.10	0.03	0.76	0.24
100	5148	31.30	5.52	3.62	1.36	21.85	37.94	0.08	101.59	2.04	0.64	0.30	0.09	2.01	2.96	0.00	8.04	0.66	0.21	0.10	0.03	0.76	0.24

Table 3.2b: Qualitative trace element analyses of Garnet II from sample 100 along traverse A-B (Plate 4.5). Relative concentrations are measured in counts/second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1273	2537	1501	982	2572	50	2548	1253	2544	1592	979	2235	97	4992	1257	2695	1527	993	2235
2	52	1224	2706	1583	977	2544	51	2600	1226	2655	1559	1059	2200	98	5044	1193	2706	1547	1068	2284
3	104	1137	2562	1595	996	2555	52	2652	1201	2601	1568	1052	2231	99	5096	1128	2803	1587	999	2250
4	156	1277	2641	1517	1021	2501	55	2808	1146	2610	1486	1058	2231	100	5148	1148	2639	1476	930	1953
5	208	1175	2537	1558	1007	2664	56	2860	1152	2576	1532	1050	2260							
6	260	1232	2459	1625	1051	2562	57	2912	1253	2522	1512	1033	2245							
7	312	1211	2552	1580	1079	2453	58	2964	1161	2589	1606	1039	2328							
8	364	1150	2587	1610	1088	2376	59	3016	1189	2520	1565	995	2371							
9	416	1175	2466	1635	1056	2470	60	3068	1170	2557	1502	1096	2371							
10	468	1214	2466	1610	1045	2487	61	3120	1155	2538	1588	1101	2268							
11	520	1220	2474	1656	1080	2456	63	3224	1215	2564	1570	1052	2316							
12	576	1197	2397	1565	1041	2463	64	3276	1147	2519	1580	1038	2334							
13	624	1164	2614	1583	1062	2453	65	3328	1178	2516	1575	1033	2315							
14	676	1128	2327	1496	936	2082	66	3380	1292	2526	1594	1047	2412							
15	728	1166	2597	1599	1061	2343	67	3432	1215	2482	1547	1074	2363							
16	780	1218	2486	1653	1019	2381	68	3484	1226	2522	1572	995	2429							
17	832	1249	2603	1580	1053	2378	69	3536	1223	2570	1577	1057	2327							
18	884	1201	2657	1593	1062	2446	70	3588	1229	2515	1575	1083	2287							
19	936	1209	2512	1592	1051	2370	71	3640	1223	2490	1533	1098	2296							
20	988	1203	2486	1573	1015	2373	72	3692	1251	2531	1590	1102	2219							
21	1040	1187	2528	1599	1031	2398	73	3744	1180	2469	1599	1034	2390							
22	1092	1169	2597	1591	1069	2412	74	3796	1149	2512	1536	1000	2373							
23	1144	1200	2564	1563	1041	2390	75	3848	1058	2491	1542	992	2189							
24	1196	1203	2485	1572	1063	2344	76	3900	1194	2501	1569	1034	2456							
25	1248	1171	2542	1635	1006	2436	77	3952	1162	2554	1584	1013	2382							
26	1300	1200	2543	1558	1065	2377	78	3990	1202	2579	1615	1080	2366							
27	1352	1232	2611	1614	1043	2353	79	4042	1183	2557	1667	1059	2547							
28	1404	1233	2576	1547	1067	2310	80	4094	1172	2529	1527	1111	2388							
29	1456	1220	2517	1528	1019	2355	81	4146	1198	2469	1660	1111	2451							
30	1508	1241	2641	1581	1015	2315	82	4212	1226	2513	1494	1055	2407							
31	1560	1195	2586	1558	1027	2315	83	4264	1269	2585	1490	1027	2380							
32	1612	1191	2467	1575	1011	2311	84	4316	1156	2567	1548	1084	2488							
33	1664	1239	2562	1535	1060	2225	86	4420	1191	2533	1579	1114	2459							
34	1716	1176	2602	1534	1032	2360	87	4472	1239	2532	1502	1044	2666							
35	1768	1138	2481	1644	1032	2461	88	4524	1215	2533	1517	1033	2514							
36	1820	1143	2505	1600	1025	2310	89	4576	1261	2652	1554	1038	2608							
37	1872	1185	2523	1541	1041	2373	90	4628	1234	2631	1588	1061	2588							
38	1924	1216	2478	1500	1058	2382	91	4680	1262	2667	1687	1030	2574							
39	1976	1228	2628	1583	1060	2286	92	4732	1202	2569	1593	1019	2506							
40	2028	1201	2545	1540	1118	2316	93	4784	1221	2672	1539	1013	2496							
41	2080	1146	2546	1608	1035	2339	94	4836	1250	2676	1551	1014	2229							
42	2132	1121	2596	1514	970	2213	95	4888	1170	2777	1583	983	2213							
49	2496	1166	2949	1661	1045	2310	96	4940	1210	2691	1558	980	2312							

Table 3.3a: Composition of Garnet I from specimen 11E2 as analyzed along traverse A-B (Plate 5.3). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
2	84	29.49	7.87	2.36	0.95	21.85	38.69	0.03	101.23	1.90	0.90	0.19	0.06	1.98	2.98	0.00	8.03	0.62	0.30	0.06	0.02	0.68	0.32
3	1367	29.19	7.90	2.17	0.80	21.64	38.57	0.07	100.34	1.90	0.91	0.18	0.05	1.98	2.99	0.00	8.02	0.62	0.30	0.06	0.02	0.67	0.33
5	335	29.02	8.38	2.06	0.76	21.80	38.50	0.12	100.63	1.88	0.97	0.17	0.05	1.99	2.98	0.01	8.03	0.61	0.32	0.06	0.02	0.66	0.34
6	418	28.70	8.34	2.01	0.75	21.64	38.62	0.00	100.00	1.86	0.96	0.17	0.05	1.98	3.00	0.00	8.02	0.61	0.32	0.05	0.02	0.66	0.34
7	502	29.32	8.25	2.10	0.88	21.88	38.76	0.06	101.24	1.89	0.95	0.17	0.06	1.98	2.98	0.00	8.03	0.62	0.31	0.06	0.02	0.67	0.33
8	586	28.73	8.25	1.94	0.67	21.79	38.77	0.00	100.09	1.86	0.95	0.16	0.04	1.99	3.00	0.00	8.00	0.62	0.32	0.05	0.01	0.66	0.34
9	669	29.52	8.27	2.17	0.71	21.93	38.97	0.10	101.66	1.89	0.94	0.18	0.05	1.98	2.99	0.01	8.02	0.62	0.31	0.06	0.01	0.67	0.33
10	753	29.05	8.44	1.99	0.65	21.73	38.92	0.00	100.73	1.87	0.97	0.16	0.04	1.97	3.00	0.00	8.02	0.61	0.32	0.05	0.01	0.66	0.34
11	837	29.33	8.72	1.90	0.70	21.90	38.68	0.00	101.19	1.88	1.00	0.16	0.05	1.98	2.97	0.00	8.04	0.61	0.32	0.05	0.01	0.65	0.35
12	920	28.93	8.65	1.93	0.72	22.13	38.97	0.03	101.37	1.85	0.99	0.16	0.05	2.00	2.98	0.00	8.02	0.61	0.32	0.05	0.02	0.65	0.35
13	1004	28.68	8.60	1.95	0.61	21.99	38.85	0.00	100.67	1.85	0.99	0.16	0.04	1.99	2.99	0.00	8.01	0.61	0.33	0.05	0.01	0.65	0.35
14	1088	28.67	8.18	2.12	0.63	21.26	38.33	0.06	99.24	1.88	0.96	0.18	0.04	1.96	3.00	0.00	8.02	0.62	0.31	0.06	0.01	0.66	0.34
15	1172	29.21	8.42	2.10	0.56	21.47	38.88	0.09	100.74	1.89	0.97	0.17	0.04	1.95	3.00	0.01	8.02	0.62	0.32	0.06	0.01	0.66	0.34
16	1255	28.77	8.06	2.09	0.55	21.76	38.62	0.03	99.88	1.87	0.93	0.17	0.04	1.99	3.00	0.00	8.00	0.62	0.31	0.06	0.01	0.67	0.33
17	1339	28.42	8.25	2.26	0.70	21.62	38.49	0.00	99.72	1.85	0.96	0.19	0.05	1.98	2.99	0.00	8.02	0.61	0.31	0.06	0.02	0.66	0.34
19	1506	28.79	7.97	2.34	0.61	21.51	38.06	0.03	99.29	1.89	0.93	0.20	0.04	1.99	2.98	0.00	8.02	0.62	0.30	0.06	0.01	0.67	0.33
21	1674	29.12	7.80	2.41	0.65	21.81	38.68	0.07	100.54	1.89	0.90	0.20	0.04	1.99	2.99	0.00	8.01	0.62	0.30	0.07	0.01	0.68	0.32
22	1757	29.18	7.85	2.36	0.78	21.98	38.46	0.00	100.46	1.89	0.91	0.20	0.05	2.00	2.98	0.01	8.02	0.62	0.30	0.06	0.02	0.68	0.32
23	1841	29.32	7.88	2.22	0.66	21.92	38.85	0.00	100.82	1.89	0.91	0.18	0.04	1.99	3.00	0.00	8.01	0.63	0.30	0.06	0.01	0.68	0.32
24	1925	29.65	7.92	2.51	0.71	21.62	38.70	0.00	101.11	1.91	0.91	0.21	0.05	1.97	2.99	0.00	8.03	0.62	0.30	0.07	0.02	0.68	0.32
25	2008	29.55	7.72	2.44	0.69	21.70	38.52	0.00	100.58	1.92	0.89	0.20	0.05	1.98	2.99	0.00	8.02	0.63	0.29	0.07	0.01	0.68	0.32
29	2343	29.75	7.59	2.48	0.54	21.52	38.59	0.00	100.45	1.93	0.88	0.21	0.04	1.97	3.00	0.00	8.02	0.63	0.29	0.07	0.01	0.69	0.31
30	2427	29.47	7.49	2.29	0.78	21.34	38.40	0.00	99.75	1.93	0.87	0.19	0.05	1.97	3.00	0.00	8.01	0.63	0.29	0.06	0.02	0.69	0.31
31	2510	29.40	7.62	2.36	0.69	21.26	38.34	0.03	99.69	1.92	0.89	0.20	0.05	1.96	3.00	0.00	8.02	0.63	0.29	0.06	0.01	0.68	0.32
32	2594	29.86	7.59	2.38	0.57	21.40	38.62	0.08	100.49	1.94	0.88	0.20	0.04	1.96	3.00	0.00	8.02	0.64	0.29	0.06	0.01	0.69	0.31
34	2761	29.60	7.57	2.37	0.63	21.65	38.58	0.04	100.43	1.92	0.88	0.20	0.04	1.98	3.00	0.00	8.01	0.63	0.29	0.07	0.01	0.69	0.31
35	2845	29.78	7.26	2.32	0.79	21.08	38.21	0.00	99.43	1.96	0.85	0.20	0.05	1.95	3.01	0.00	8.02	0.64	0.28	0.06	0.02	0.70	0.30

36	2929	30.00	7.64	2.30	0.69	21.74	38.29	0.12	100.77	1.95	0.88	0.19	0.05	1.99	2.97	0.01	8.03	0.63	0.29	0.06	0.01	0.69	0.31
37	3012	29.83	7.56	2.43	0.79	21.43	38.49	0.07	100.59	1.94	0.88	0.20	0.05	1.96	2.99	0.00	8.03	0.63	0.29	0.07	0.02	0.69	0.31
38	3096	29.55	7.51	2.37	0.78	21.26	38.46	0.05	99.97	1.93	0.87	0.20	0.05	1.96	3.00	0.00	8.02	0.63	0.29	0.06	0.02	0.69	0.31
39	3180	29.79	7.47	2.33	0.66	21.60	38.42	0.06	100.33	1.94	0.87	0.19	0.04	1.98	2.99	0.00	8.02	0.64	0.28	0.06	0.01	0.69	0.31
40	3264	30.27	7.47	2.51	0.81	21.60	38.47	0.00	101.02	1.96	0.86	0.21	0.05	1.97	2.98	0.00	8.03	0.64	0.28	0.07	0.02	0.69	0.31
41	3347	29.99	7.45	2.56	0.71	21.33	38.37	0.05	100.45	1.96	0.87	0.21	0.05	1.96	2.99	0.00	8.03	0.63	0.28	0.07	0.02	0.69	0.31
42	3431	30.04	7.29	2.62	0.67	21.40	38.30	0.03	100.36	1.96	0.85	0.22	0.04	1.97	2.99	0.00	8.03	0.64	0.28	0.07	0.01	0.70	0.30
43	3515	29.78	7.33	2.54	0.66	21.80	38.39	0.00	100.49	1.94	0.85	0.21	0.04	2.00	2.98	0.00	8.02	0.64	0.28	0.07	0.01	0.70	0.30
44	3598	29.60	7.09	2.51	0.69	21.60	38.52	0.00	99.95	1.93	0.82	0.21	0.05	1.99	3.00	0.00	8.00	0.64	0.27	0.07	0.02	0.70	0.30
45	3682	30.09	6.94	2.46	0.81	21.40	38.10	0.01	99.81	1.98	0.81	0.21	0.05	1.98	2.99	0.00	8.02	0.65	0.27	0.07	0.02	0.71	0.29
46	3766	29.94	7.40	2.58	0.74	21.48	38.37	0.00	100.41	1.95	0.86	0.22	0.05	1.97	2.99	0.00	8.03	0.63	0.28	0.07	0.02	0.69	0.31
47	3849	29.84	7.53	2.68	0.70	21.52	38.48	0.02	100.76	1.94	0.87	0.22	0.05	1.97	2.99	0.00	8.03	0.63	0.28	0.07	0.01	0.69	0.31
48	3933	28.71	8.06	2.53	0.75	21.83	38.63	0.00	100.48	1.86	0.93	0.21	0.05	1.99	2.99	0.00	8.02	0.61	0.31	0.07	0.02	0.67	0.33
49	4017	29.41	7.62	2.59	0.85	21.57	38.45	0.00	100.39	1.91	0.88	0.22	0.06	1.97	2.99	0.00	8.03	0.62	0.29	0.07	0.02	0.68	0.32
51	4184	29.71	7.52	2.64	0.71	21.69	38.54	0.16	100.98	1.92	0.87	0.22	0.05	1.98	2.99	0.01	8.02	0.63	0.28	0.07	0.02	0.69	0.31
52	4268	29.59	7.45	2.61	0.67	21.48	38.27	0.02	100.09	1.93	0.87	0.22	0.04	1.98	2.99	0.00	8.02	0.63	0.28	0.07	0.01	0.69	0.31
53	4351	29.55	7.59	2.65	0.71	21.67	38.65	0.06	100.88	1.91	0.88	0.22	0.05	1.98	2.99	0.00	8.02	0.63	0.29	0.07	0.02	0.69	0.31
54	4435	29.32	7.76	2.72	0.90	21.80	38.69	0.00	101.13	1.89	0.89	0.22	0.06	1.98	2.98	0.00	8.03	0.62	0.29	0.07	0.02	0.68	0.32
57	4686	28.92	7.80	2.70	0.95	21.24	38.62	0.04	100.27	1.88	0.90	0.22	0.06	1.95	3.00	0.00	8.02	0.61	0.29	0.07	0.02	0.68	0.32
58	4770	29.23	7.61	2.76	0.87	21.58	38.65	0.03	100.74	1.89	0.88	0.23	0.06	1.97	2.99	0.00	8.02	0.62	0.29	0.07	0.02	0.68	0.32
59	4853	29.43	7.56	2.72	0.98	21.25	38.34	0.01	100.28	1.92	0.88	0.23	0.06	1.95	2.99	0.00	8.03	0.62	0.28	0.07	0.02	0.69	0.31
60	4937	28.93	7.76	2.57	0.70	21.98	38.45	0.00	100.32	1.87	0.90	0.21	0.05	2.01	2.98	0.00	8.02	0.62	0.30	0.07	0.02	0.68	0.32
61	5021	28.57	7.71	2.59	0.81	21.20	38.40	0.00	99.27	1.87	0.90	0.22	0.05	1.96	3.01	0.00	8.01	0.62	0.30	0.07	0.02	0.68	0.32
62	5104	29.01	7.69	2.69	0.78	21.50	38.58	0.02	100.27	1.88	0.89	0.22	0.05	1.97	3.00	0.00	8.02	0.62	0.29	0.07	0.02	0.68	0.32
63	5188	29.11	7.72	2.69	0.89	21.44	38.41	0.00	100.24	1.89	0.90	0.22	0.06	1.97	2.99	0.00	8.03	0.62	0.29	0.07	0.02	0.68	0.32
64	5272	28.78	8.00	2.67	0.92	21.92	38.99	0.06	101.34	1.85	0.92	0.22	0.06	1.98	2.99	0.00	8.02	0.61	0.30	0.07	0.02	0.67	0.33
66	5439	28.84	7.85	2.57	1.01	21.67	38.25	0.11	100.30	1.88	0.91	0.21	0.07	1.99	2.98	0.01	8.03	0.61	0.30	0.07	0.02	0.67	0.33
68	5607	29.12	7.85	2.46	0.70	21.82	38.65	0.00	100.51	1.88	0.91	0.20	0.05	1.99	2.99	0.00	8.02	0.62	0.30	0.07	0.02	0.68	0.32
69	5690	28.45	8.15	2.38	0.99	21.63	38.90	0.14	100.63	1.84	0.94	0.20	0.06	1.97	3.00	0.01	8.01	0.61	0.31	0.06	0.02	0.66	0.34
70	5774	29.01	7.95	2.51	0.97	21.34	38.40	0.00	100.09	1.89	0.92	0.21	0.06	1.96	2.99	0.00	8.03	0.61	0.30	0.07	0.02	0.67	0.33
71	5858	28.70	8.07	2.65	1.03	21.75	38.94	0.15	101.29	1.85	0.92	0.22	0.07	1.97	2.99	0.01	8.02	0.60	0.30	0.07	0.02	0.67	0.33
72	5941	28.54	7.98	2.59	0.81	21.64	38.66	0.10	100.32	1.85	0.92	0.22	0.05	1.98	3.00	0.01	8.01	0.61	0.30	0.07	0.02	0.67	0.33
73	6025	28.68	8.22	2.57	0.84	21.71	38.36	0.05	100.44	1.86	0.95	0.21	0.06	1.98	2.97	0.00	8.03	0.60	0.31	0.07	0.02	0.66	0.34
74	6109	29.04	8.27	2.57	0.85	21.39	38.47	0.03	100.62	1.88	0.96	0.21	0.06	1.95	2.98	0.00	8.04	0.61	0.31	0.07	0.02	0.66	0.34

75	6192	28.01	8.15	2.39	1.03	21.90	39.14	0.00	100.59	1.80	0.93	0.20	0.07	1.99	3.01	0.00	8.00	0.60	0.31	0.07	0.02	0.66	0.34
76	6276	28.58	8.16	2.43	0.97	21.85	38.87	0.00	100.81	1.84	0.94	0.20	0.06	1.98	2.99	0.00	8.02	0.61	0.31	0.07	0.02	0.66	0.34
77	6360	28.77	8.05	2.44	1.00	21.54	38.72	0.00	100.45	1.86	0.93	0.20	0.07	1.96	3.00	0.00	8.02	0.61	0.30	0.07	0.02	0.67	0.33
78	6443	28.50	8.18	2.38	0.84	21.57	38.40	0.10	99.96	1.85	0.95	0.20	0.06	1.98	2.99	0.01	8.02	0.61	0.31	0.07	0.02	0.66	0.34
79	6527	28.31	8.25	2.56	0.89	21.32	38.49	0.05	99.87	1.84	0.96	0.21	0.06	1.96	3.00	0.00	8.03	0.60	0.31	0.07	0.02	0.66	0.34
80	6611	28.95	8.40	2.70	0.89	21.92	38.88	0.00	101.72	1.85	0.96	0.22	0.06	1.98	2.97	0.00	8.04	0.60	0.31	0.07	0.02	0.66	0.34
81	6694	28.35	8.14	2.76	0.80	21.78	38.68	0.03	100.55	1.83	0.94	0.23	0.05	1.98	2.99	0.00	8.02	0.60	0.31	0.07	0.02	0.66	0.34
82	6778	27.76	8.33	2.58	1.16	21.60	38.77	0.03	100.22	1.80	0.96	0.21	0.08	1.97	3.00	0.00	8.02	0.59	0.32	0.07	0.02	0.65	0.35
83	6862	27.76	8.37	2.72	1.04	21.53	38.98	0.00	100.40	1.79	0.96	0.22	0.07	1.96	3.01	0.00	8.01	0.59	0.32	0.07	0.02	0.65	0.35
84	6945	28.04	8.32	2.72	1.09	21.77	39.04	0.00	100.94	1.80	0.95	0.22	0.07	1.97	3.00	0.00	8.02	0.59	0.31	0.07	0.02	0.65	0.35
85	7029	27.87	8.40	2.75	1.01	21.57	38.59	0.00	100.15	1.81	0.97	0.23	0.07	1.97	2.99	0.00	8.03	0.59	0.32	0.07	0.02	0.65	0.35
86	7113	27.41	8.54	2.58	0.95	21.49	38.65	0.00	99.60	1.78	0.99	0.21	0.06	1.97	3.00	0.00	8.01	0.58	0.32	0.07	0.02	0.64	0.36
87	7196	27.34	8.32	2.75	1.03	21.63	38.50	0.08	99.65	1.78	0.96	0.23	0.07	1.98	2.99	0.00	8.02	0.58	0.32	0.08	0.02	0.65	0.35
89	7364	27.67	8.53	2.71	1.10	21.69	39.13	0.00	100.81	1.78	0.98	0.22	0.07	1.96	3.00	0.00	8.01	0.58	0.32	0.07	0.02	0.65	0.35
90	7448	27.95	8.65	2.79	0.85	21.77	38.92	0.05	100.98	1.79	0.99	0.23	0.06	1.97	2.99	0.00	8.03	0.58	0.32	0.07	0.02	0.64	0.36
91	7531	27.99	8.49	2.59	1.01	21.67	38.70	0.10	100.55	1.81	0.98	0.21	0.07	1.97	2.99	0.01	8.03	0.59	0.32	0.07	0.02	0.65	0.35
92	7615	27.78	8.53	2.82	0.98	21.65	38.76	0.00	100.50	1.79	0.98	0.23	0.06	1.97	2.99	0.00	8.03	0.58	0.32	0.08	0.02	0.65	0.35
94	7782	28.29	8.75	2.80	1.08	21.47	38.77	0.00	101.11	1.82	1.00	0.23	0.07	1.94	2.98	0.00	8.05	0.58	0.32	0.07	0.02	0.64	0.36
95	7866	28.03	8.59	2.67	0.98	21.69	38.84	0.04	100.84	1.80	0.99	0.22	0.06	1.97	2.99	0.00	8.03	0.59	0.32	0.07	0.02	0.65	0.35
96	7950	27.61	8.39	2.80	1.10	21.78	38.78	0.00	100.44	1.78	0.96	0.23	0.07	1.98	2.99	0.00	8.02	0.58	0.32	0.08	0.02	0.65	0.35
97	8033	27.37	8.56	2.57	0.93	21.50	38.44	0.00	99.38	1.78	0.99	0.21	0.06	1.97	2.99	0.00	8.02	0.58	0.33	0.07	0.02	0.64	0.36
98	8117	27.80	8.66	2.61	0.99	21.42	38.66	0.04	100.18	1.80	1.00	0.22	0.07	1.95	2.99	0.00	8.03	0.58	0.32	0.07	0.02	0.64	0.36
101	8368	27.41	8.60	2.71	0.79	21.64	38.87	0.14	100.16	1.77	0.99	0.22	0.05	1.97	3.00	0.01	8.01	0.58	0.33	0.07	0.02	0.64	0.36
102	8452	27.78	8.68	2.59	0.99	21.81	39.15	0.00	100.92	1.78	0.99	0.21	0.06	1.97	3.00	0.00	8.02	0.58	0.33	0.07	0.02	0.64	0.36
103	8635	27.97	8.47	2.69	1.01	21.48	38.41	0.05	100.07	1.82	0.98	0.22	0.07	1.97	2.98	0.00	8.03	0.59	0.32	0.07	0.02	0.65	0.35
104	8619	27.53	8.70	2.79	0.76	21.73	39.01	0.05	100.58	1.77	1.00	0.23	0.05	1.97	3.00	0.00	8.02	0.58	0.33	0.08	0.02	0.64	0.36
105	8703	27.38	9.06	2.59	1.04	21.84	39.20	0.02	101.14	1.75	1.03	0.21	0.07	1.97	2.99	0.00	8.02	0.57	0.34	0.07	0.02	0.63	0.37
106	8786	27.55	8.81	2.67	0.80	21.61	38.81	0.02	100.27	1.78	1.01	0.22	0.05	1.97	2.99	0.00	8.02	0.58	0.33	0.07	0.02	0.64	0.36
107	8870	27.22	8.71	2.43	0.81	21.16	38.72	0.00	98.99	1.78	1.01	0.20	0.05	1.94	3.02	0.00	8.01	0.58	0.33	0.07	0.02	0.64	0.36
108	8954	27.60	8.77	2.39	1.03	21.80	38.91	0.23	100.73	1.78	1.01	0.20	0.07	1.98	2.99	0.01	8.02	0.58	0.33	0.06	0.02	0.64	0.36
109	9037	27.49	8.73	2.63	0.68	21.59	38.64	0.16	99.93	1.78	1.01	0.22	0.04	1.97	2.99	0.01	8.02	0.58	0.33	0.07	0.01	0.64	0.36
110	9121	27.65	8.84	2.34	0.75	21.47	38.76	0.01	99.81	1.79	1.02	0.19	0.05	1.96	3.00	0.00	8.02	0.59	0.33	0.06	0.02	0.64	0.36
111	9205	28.11	8.96	2.46	0.64	21.65	38.98	0.14	100.95	1.81	1.03	0.20	0.04	1.96	2.99	0.01	8.03	0.59	0.33	0.07	0.01	0.64	0.36
112	9288	27.71	8.68	2.37	0.90	21.71	38.42	0.01	99.80	1.80	1.00	0.20	0.06	1.99	2.98	0.00	8.03	0.59	0.33	0.06	0.02	0.64	0.36

113	9372	27.95	8.64	2.19	0.67	21.42	38.68	0.00	99.56	1.82	1.00	0.18	0.04	1.96	3.01	0.00	8.01	0.60	0.33	0.06	0.01	0.64	0.36
114	9456	28.46	8.91	2.05	0.63	21.74	38.73	0.01	100.54	1.83	1.02	0.17	0.04	1.97	2.98	0.00	8.03	0.60	0.33	0.06	0.01	0.64	0.36
115	9540	28.76	8.89	2.02	0.80	21.50	38.46	0.00	100.35	1.86	1.03	0.17	0.05	1.96	2.98	0.00	8.04	0.60	0.33	0.05	0.02	0.64	0.36
118	9791	28.91	8.11	1.95	0.75	21.70	38.54	0.06	100.03	1.88	0.94	0.16	0.05	1.99	2.99	0.00	8.01	0.62	0.31	0.05	0.02	0.67	0.33
119	9874	28.42	8.70	2.30	0.84	21.78	38.69	0.00	100.72	1.83	1.00	0.19	0.05	1.98	2.98	0.00	8.03	0.60	0.32	0.06	0.02	0.65	0.35
120	9958	27.99	8.86	2.38	0.53	22.02	39.19	0.02	100.99	1.79	1.01	0.19	0.03	1.98	3.00	0.00	8.01	0.59	0.33	0.06	0.01	0.64	0.36
121	10042	27.77	8.76	2.53	0.76	21.55	38.87	0.00	100.23	1.79	1.01	0.21	0.05	1.96	3.00	0.00	8.02	0.59	0.33	0.07	0.02	0.64	0.36
122	10125	27.76	8.68	2.39	0.69	21.80	39.01	0.03	100.37	1.79	1.00	0.20	0.04	1.98	3.00	0.00	8.01	0.59	0.33	0.07	0.01	0.64	0.36
123	10209	28.39	8.82	2.29	0.63	21.34	38.24	0.01	99.72	1.85	1.02	0.19	0.04	1.96	2.98	0.00	8.04	0.60	0.33	0.06	0.01	0.64	0.36
124	10293	28.15	8.92	2.43	0.73	21.74	38.92	0.00	100.85	1.81	1.02	0.20	0.05	1.97	2.99	0.00	8.03	0.59	0.33	0.07	0.02	0.64	0.36
125	10376	28.01	8.99	2.45	0.63	21.79	38.62	0.01	100.49	1.80	1.03	0.20	0.04	1.98	2.98	0.00	8.04	0.59	0.34	0.07	0.01	0.64	0.36
127	10544	27.97	8.57	2.34	0.65	21.10	39.45	0.00	99.96	1.81	0.99	0.19	0.04	1.92	3.05	0.00	7.99	0.60	0.33	0.06	0.01	0.65	0.35
129	10711	27.71	8.92	2.54	0.63	22.16	38.98	0.21	101.16	1.77	1.02	0.21	0.04	2.00	2.98	0.01	8.02	0.58	0.33	0.07	0.01	0.64	0.36
130	10795	27.56	8.79	2.59	0.66	21.74	38.37	0.00	99.70	1.79	1.02	0.22	0.04	1.99	2.98	0.00	8.03	0.58	0.33	0.07	0.01	0.64	0.36
131	10878	27.83	8.90	2.67	0.70	21.79	38.90	0.07	100.87	1.79	1.02	0.22	0.05	1.97	2.99	0.00	8.03	0.58	0.33	0.07	0.01	0.64	0.36
132	10962	29.34	7.84	2.55	0.74	22.00	38.63	0.01	101.11	1.89	0.90	0.21	0.05	2.00	2.98	0.00	8.02	0.62	0.30	0.07	0.02	0.68	0.32
134	11046	27.70	9.09	2.41	0.59	21.97	39.34	0.02	101.13	1.77	1.03	0.20	0.04	1.98	3.00	0.00	8.01	0.58	0.34	0.06	0.01	0.63	0.37
135	11213	27.64	8.78	2.25	0.58	21.38	38.53	0.00	99.15	1.80	1.02	0.19	0.04	1.96	3.00	0.00	8.01	0.59	0.33	0.06	0.01	0.64	0.36
137	11380	28.16	8.88	2.42	0.61	22.08	39.03	0.00	101.09	1.80	1.01	0.20	0.04	1.99	2.98	0.00	8.02	0.59	0.33	0.07	0.01	0.64	0.36
138	11464	28.34	8.76	2.38	0.62	22.00	38.76	0.00	100.84	1.82	1.00	0.20	0.04	1.99	2.98	0.00	8.03	0.60	0.33	0.06	0.01	0.64	0.36
139	11548	27.96	8.81	2.46	0.65	21.77	38.86	0.00	100.47	1.80	1.01	0.20	0.04	1.98	2.99	0.00	8.02	0.59	0.33	0.07	0.01	0.64	0.36
140	11632	28.51	8.57	2.55	0.63	21.92	38.89	0.00	100.98	1.83	0.98	0.21	0.04	1.98	2.98	0.00	8.03	0.60	0.32	0.07	0.01	0.65	0.35
141	11715	28.50	8.58	2.42	0.53	21.72	38.43	0.00	100.18	1.85	0.99	0.20	0.03	1.98	2.98	0.00	8.03	0.60	0.32	0.07	0.01	0.65	0.35
142	11799	28.25	8.81	2.42	0.64	21.51	38.64	0.00	100.27	1.83	1.02	0.20	0.04	1.96	2.99	0.00	8.03	0.59	0.33	0.07	0.01	0.64	0.36
143	11883	29.17	8.63	2.29	0.90	21.78	38.91	0.00	101.62	1.87	0.98	0.19	0.06	1.96	2.98	0.00	8.04	0.60	0.32	0.06	0.02	0.65	0.35
145	12050	28.67	8.45	2.28	0.85	21.55	38.43	0.11	100.33	1.86	0.98	0.19	0.06	1.97	2.98	0.01	8.03	0.60	0.32	0.06	0.02	0.66	0.34
146	12134	28.70	7.92	2.33	0.90	21.38	38.55	0.10	99.88	1.87	0.92	0.19	0.06	1.96	3.00	0.01	8.01	0.61	0.30	0.06	0.02	0.67	0.33
147	12217	28.70	8.03	2.32	0.90	21.88	38.85	0.00	100.68	1.85	0.92	0.19	0.06	1.99	3.00	0.00	8.01	0.61	0.31	0.06	0.02	0.67	0.33
148	12301	29.22	7.72	2.08	0.65	21.51	38.24	0.16	99.59	1.91	0.90	0.17	0.04	1.99	2.99	0.01	8.01	0.63	0.30	0.06	0.01	0.68	0.32
149	12385	29.30	7.87	1.82	1.02	21.56	38.53	0.00	100.07	1.91	0.91	0.15	0.07	1.98	3.00	0.00	8.01	0.63	0.30	0.05	0.02	0.68	0.32

Table 3.3b: Qualitative trace element analyses of Garnet I from specimen 11E2 along traverse A-B (Plate 5.3). Relative concentrations are measured in counts/second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1095	2234	1484	992	2247	59	3634	1082	2264	1551	929	1678	110	6829	1141	2188	1461	917	1680
2	63	1002	2326	1454	950	2144	60	3696	1153	2086	1498	946	1707	111	6892	1144	2162	1518	964	1665
3	125	1119	2118	1463	994	2193	61	3759	1052	2028	1518	940	1741	112	6954	1066	2205	1431	956	1703
4	188	1064	2243	1382	967	2117	62	3822	1101	1976	1496	948	1822	113	7017	1103	2270	1515	1053	1759
5	251	896	1795	1371	922	2159	63	3884	1186	2111	1539	989	1659	114	7079	1106	2173	1480	921	1714
6	313	1051	2158	1487	971	2058	64	3947	1156	2149	1563	994	1674	115	7142	1148	2246	1482	879	1707
7	376	1088	2148	1413	965	1941	65	4010	1127	2080	1465	1003	1649	116	7205	1107	2094	1471	898	1693
8	439	1081	2100	1394	915	1865	66	4072	1040	2044	1542	936	1682	117	7267	1183	2047	1482	945	1722
9	501	1061	2112	1509	919	1891	67	4135	1109	2103	1497	965	1728	118	7330	1123	2212	1453	927	1692
10	564	1095	2022	1487	1006	1931	68	4198	1127	2164	1552	916	1611	119	7393	1137	2100	1412	912	1733
11	627	1065	2128	1473	932	2010	69	4260	1121	2109	1589	1016	1727	120	7455	1136	2103	1483	916	1632
12	689	1079	2131	1470	931	2090	70	4323	1069	2091	1577	978	1748	121	7518	1159	2102	1519	998	1673
13	752	1080	2101	1505	939	1924	71	4386	1144	2039	1534	941	1721	122	7581	1135	2111	1504	902	1708
14	814	1038	2106	1480	960	1934	72	4448	1161	2091	1569	992	1688	123	7643	1168	2106	1484	1005	1641
15	877	1107	2070	1496	1021	1766	74	4573	1119	2251	1557	939	1669	124	7706	1116	2168	1468	902	1751
16	940	1114	2085	1444	1018	1795	75	4636	1122	2231	1434	965	1738	125	7769	1158	2055	1444	965	1649
17	1002	1195	2218	1447	963	1760	76	4699	1143	2177	1528	934	1787	126	7831	1133	2084	1446	955	1758
18	1065	1115	2232	1366	959	1756	78	4824	1089	2051	1591	978	1671	127	7894	1147	2198	1433	946	1690
19	1128	1118	2051	1445	1000	1810	79	4887	1124	2135	1597	956	1704	128	7957	1195	2269	1430	874	1658
20	1190	1098	2074	1458	980	1828	80	4949	1134	2061	1577	975	1657	129	8019	1147	2016	1440	964	1711
21	1253	1094	2022	1436	927	1705	81	5012	1114	2112	1515	971	1801	130	8082	1072	2114	1513	931	1661
22	1316	1099	2121	1420	928	1685	82	5075	1078	2093	1587	890	1746	131	8145	1037	2065	1458	940	1707
23	1378	1125	2005	1537	1020	1722	83	5137	1146	2069	1599	901	1736	132	8207	1067	2082	1497	946	1631
24	1441	1088	2056	1460	995	1745	84	5200	1118	2132	1437	971	1748	133	8270	1124	2019	1566	979	1650
26	1566	1082	2134	1475	993	1672	85	5263	1102	2114	1527	888	1668	134	8332	1086	2021	1510	986	1749
27	1629	1148	2012	1476	980	1833	86	5325	1091	1946	1234	883	1841	135	8395	1094	2092	1426	957	1678
28	1692	1102	2090	1408	974	1705	87	5388	1153	2163	1449	931	1674	136	8458	1098	2043	1538	947	1623
29	1754	1115	2102	1469	1036	1659	88	5451	1172	2196	1495	963	1667	137	8520	1076	2076	1498	880	1727
31	1880	1112	2003	1660	866	2043	90	5576	1193	2218	1504	943	1721	138	8583	1104	2068	1460	933	1709
32	1942	1092	2164	1486	1005	1740	91	5639	1240	2175	1494	938	1725	139	8646	1139	2071	1453	979	1690
33	2005	1217	2145	1503	924	1687	92	5701	1105	2239	1418	1005	1689	140	8708	1100	2083	1498	974	1752
34	2067	1026	2199	1405	987	1671	93	5764	1131	2142	1582	882	1711	141	8771	1106	2017	1478	940	1645
46	2819	1096	2269	1528	989	1634	94	5826	1141	2075	1480	902	1746	142	8834	1201	2097	1427	920	1699
47	2882	1100	2319	1497	983	1825	95	5889	1135	2127	1480	923	1738	143	8896	1118	2114	1423	958	1736
48	2945	1097	2152	1504	906	1969	96	5952	1074	2010	1508	1005	1672	144	8959	1162	2248	1431	945	1721
49	3007	1144	2256	1485	991	1676	97	6014	1155	2039	1461	954	1661	148	9210	1135	2231	1468	884	1641
50	3070	1151	2245	1505	988	1618	98	6077	1085	2074	1504	898	1693	149	9272	1124	2243	1489	947	1598
51	3133	1179	2232	1473	981	1719	99	6140	1122	2049	1489	935	1692	150	9335	1159	2204	1487	965	1697
52	3195	1158	2182	1514	993	1833	100	6202	1069	2122	1471	877	1689	152	9460	1138	2138	1421	950	1667
53	3258	1202	2201	1464	977	1704	101	6265	1222	2057	1425	966	1640	153	9523	1107	2182	1467	915	1672
54	3320	1152	2202	1498	981	1736	103	6390	1130	2132	1459	910	1655	156	9711	1054	2094	1424	988	1997
55	3383	1174	2089	1531	938	1746	104	6453	1124	2000	1409	954	1641	157	9773	1128	2262	1458	964	1818
57	3508	1152	2161	1522	965	1756	105	6516	1110	2239	1515	972	1728	158	9836	1120	2191	1468	937	1584
58	3571	1051	2067	1456	996	1768	106	6578	1161	2203	1490	960	1710	159	9899	1102	2216	1436	972	1675

160	9961	1091	2157	1494	951	1693	176	10964	1091	2155	1475	995	1704	189	11778	1085	2201	1460	1034	1805
162	10087	1184	2159	1432	908	1666	177	11026	1269	2169	1380	1026	1759	190	11841	2060	1479	962	1693	1693
164	10212	1153	2224	1478	980	1641	178	11089	1115	2110	1493	1001	1705	191	11904	2064	1502	975	1684	1684
165	10275	973	1873	1390	895	1714	179	11152	1085	2243	1483	1032	1592	192	11966	2175	1527	1057	1767	1767
166	10337	1162	2314	1472	983	1726	180	11214	1098	2239	1450	1009	1733	193	12029	2113	1485	941	1765	1765
167	10400	1043	2039	1496	940	1640	181	11277	1059	2222	1501	970	1773	194	12091	2061	1424	1002	1754	1754
168	10463	1126	2275	1477	936	1709	182	11340	1100	2320	1481	987	1650	195	12154	2153	1483	978	1717	1717
169	10525	1118	2229	1573	962	1693	183	11402	1121	2138	1511	1038	1665	196	12217	2198	1431	1030	1781	1781
170	10588	1075	2172	1458	948	1608	184	11465	1153	2123	1447	965	1755	197	12279	2153	1433	990	1726	1726
171	10651	1093	2105	1492	943	1690	185	11528	1131	2125	1500	945	1649	199	12405	2123	1250	965	1609	1609
172	10713	1069	2177	1434	970	1665	186	11590	1087	2202	1436	1006	1698	200	12467	1084	2122	1563	980	1885
174	10838	1088	2112	1452	966	1599	187	11653	1136	2116	1482	948	1710							
175	10901	1121	2107	1457	959	1692	188	11716	1121	2188	1511	1020	1793							

Table 3.4a: Composition of Garnet I from specimen 11E2 as analyzed along traverse C-D (Plate 5.3). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	31.27	7.09	1.69	0.92	21.68	38.36	0.00	100.98	2.03	0.82	0.14	0.06	1.99	2.98	0.00	8.02	0.67	0.27	0.05	0.02	0.29	0.71
2	94	30.39	7.70	1.82	0.87	21.69	38.75	0.00	101.18	1.96	0.89	0.15	0.06	1.97	2.99	0.00	8.02	0.64	0.29	0.05	0.02	0.31	0.69
3	187	28.88	8.21	1.56	0.78	20.30	35.36	0.00	94.96	1.99	1.01	0.14	0.05	1.98	2.92	0.00	8.09	0.62	0.32	0.04	0.02	0.34	0.66
4	281	29.88	8.00	2.07	1.04	21.24	38.79	0.16	101.18	1.93	0.92	0.17	0.07	1.94	3.00	0.01	8.03	0.62	0.30	0.06	0.02	0.32	0.68
5	274	29.38	8.26	2.05	0.96	21.79	38.73	0.00	101.12	1.89	0.95	0.17	0.06	1.98	2.98	0.00	8.03	0.62	0.31	0.06	0.02	0.33	0.67
6	468	29.12	8.29	2.12	0.67	21.60	38.87	0.00	100.68	1.88	0.95	0.18	0.04	1.97	3.00	0.00	8.02	0.62	0.31	0.06	0.01	0.34	0.66
7	562	28.96	8.22	2.18	0.61	21.91	38.95	0.00	100.79	1.86	0.94	0.18	0.04	1.99	3.00	0.00	8.01	0.62	0.31	0.06	0.01	0.34	0.66
9	749	29.14	8.26	2.20	0.55	21.38	38.07	0.00	99.57	1.91	0.96	0.18	0.04	1.97	2.98	0.00	8.04	0.62	0.31	0.06	0.01	0.34	0.66
10	843	29.20	8.39	2.31	0.54	21.63	38.76	0.05	100.89	1.88	0.96	0.19	0.04	1.97	2.99	0.00	8.03	0.61	0.31	0.06	0.01	0.34	0.66
11	936	28.75	8.33	2.31	0.51	21.64	38.54	0.04	100.12	1.86	0.96	0.19	0.03	1.98	2.99	0.00	8.02	0.61	0.32	0.06	0.01	0.34	0.66
12	1030	28.87	8.11	2.46	0.47	21.32	38.38	0.08	99.69	1.88	0.94	0.21	0.03	1.96	3.00	0.00	8.02	0.61	0.31	0.07	0.01	0.33	0.67
13	1123	29.00	8.09	2.53	0.52	21.54	39.08	0.00	100.71	1.87	0.93	0.21	0.03	1.96	3.01	0.00	8.01	0.61	0.31	0.07	0.01	0.33	0.67
14	1217	29.20	8.35	2.49	0.48	21.73	38.61	0.10	100.95	1.88	0.96	0.21	0.03	1.98	2.98	0.01	8.03	0.61	0.31	0.07	0.01	0.34	0.66
15	1311	29.02	8.15	2.50	0.49	21.77	38.87	0.00	100.75	1.87	0.94	0.21	0.03	1.98	2.99	0.00	8.02	0.61	0.31	0.07	0.01	0.33	0.67
16	1404	29.50	8.25	2.45	0.38	21.86	38.76	0.07	101.26	1.90	0.95	0.20	0.02	1.98	2.98	0.00	8.03	0.62	0.31	0.07	0.01	0.33	0.67
17	1498	29.01	8.20	2.42	0.53	21.59	38.73	0.06	100.53	1.88	0.95	0.20	0.03	1.97	3.00	0.00	8.02	0.61	0.31	0.07	0.01	0.34	0.66
18	1592	28.80	7.90	2.49	0.46	21.63	37.78	0.10	99.16	1.89	0.93	0.21	0.03	2.00	2.97	0.01	8.03	0.62	0.30	0.07	0.01	0.33	0.67
19	1685	29.43	7.96	2.47	0.45	21.76	38.44	0.00	100.47	1.91	0.92	0.21	0.03	1.99	2.98	0.00	8.03	0.62	0.30	0.07	0.01	0.33	0.67
20	1779	28.91	8.11	2.48	0.51	21.71	38.81	0.00	100.47	1.87	0.93	0.20	0.03	1.98	3.00	0.00	8.01	0.61	0.31	0.07	0.01	0.33	0.67
21	1872	29.72	7.91	2.55	0.58	21.58	38.84	0.00	101.15	1.92	0.91	0.21	0.04	1.96	2.99	0.00	8.03	0.62	0.30	0.07	0.01	0.32	0.68
22	1966	29.36	7.67	2.56	0.71	21.63	38.44	0.03	100.39	1.91	0.89	0.21	0.05	1.98	2.99	0.00	8.02	0.62	0.29	0.07	0.02	0.32	0.68
23	2060	29.37	7.42	2.56	0.65	21.32	38.84	0.23	100.39	1.91	0.86	0.21	0.04	1.95	3.02	0.01	8.00	0.63	0.28	0.07	0.01	0.31	0.69
24	2153	29.27	7.76	2.54	0.66	21.42	38.53	0.00	100.10	1.90	0.90	0.21	0.04	1.96	3.00	0.00	8.02	0.62	0.29	0.07	0.01	0.32	0.68
25	2247	29.67	7.69	2.46	0.52	21.77	38.89	0.00	100.93	1.91	0.88	0.20	0.03	1.98	3.00	0.00	8.01	0.63	0.29	0.07	0.01	0.32	0.68
26	2341	29.67	7.56	2.45	0.64	21.73	38.47	0.07	100.58	1.93	0.87	0.20	0.04	1.99	2.99	0.00	8.02	0.63	0.29	0.07	0.01	0.31	0.69
27	1434	29.52	7.60	2.46	0.53	21.78	38.67	0.00	100.48	1.91	0.88	0.20	0.03	1.99	2.99	0.00	8.01	0.63	0.29	0.07	0.01	0.31	0.69
28	2528	29.86	7.87	2.46	0.57	21.33	38.73	0.00	100.80	1.93	0.91	0.20	0.04	1.95	3.00	0.00	8.03	0.63	0.29	0.07	0.01	0.32	0.68
29	2621	29.49	7.41	2.47	0.64	21.35	38.58	0.00	99.93	1.92	0.86	0.21	0.04	1.96	3.01	0.00	8.01	0.63	0.28	0.07	0.01	0.31	0.69

30	2715	29.67	7.52	2.38	0.58	21.30	38.61	0.01	100.07	1.93	0.87	0.20	0.04	1.96	3.01	0.00	8.01	0.64	0.29	0.07	0.01	0.31	0.69
31	2809	31.28	7.00	2.68	0.64	21.75	38.68	0.00	101.98	2.01	0.80	0.22	0.04	1.97	2.98	0.00	8.03	0.65	0.26	0.07	0.01	0.29	0.71
32	2902	29.27	7.60	2.50	0.58	21.59	38.57	0.01	100.13	1.90	0.88	0.21	0.04	1.98	3.00	0.00	8.01	0.63	0.29	0.07	0.01	0.32	0.68
33	2996	29.75	7.76	2.52	0.77	21.27	38.51	0.04	100.62	1.93	0.90	0.21	0.05	1.95	2.99	0.00	8.03	0.63	0.29	0.07	0.02	0.32	0.68
34	3089	29.95	7.76	2.63	0.71	21.81	38.60	0.08	101.55	1.93	0.89	0.22	0.05	1.98	2.97	0.00	8.04	0.63	0.29	0.07	0.02	0.32	0.68
35	3183	29.14	7.92	2.52	0.61	21.60	38.72	0.00	100.47	1.89	0.91	0.21	0.04	1.97	3.00	0.00	8.02	0.62	0.30	0.07	0.01	0.33	0.67
36	3277	28.48	7.63	2.71	0.70	21.37	38.07	0.00	98.95	1.87	0.89	0.23	0.05	1.98	2.99	0.00	8.02	0.62	0.29	0.08	0.02	0.32	0.68
37	3370	29.45	7.78	2.49	0.70	21.56	38.85	0.00	100.82	1.90	0.90	0.21	0.05	1.96	3.00	0.00	8.02	0.62	0.29	0.07	0.02	0.32	0.68
38	3464	29.44	7.87	2.54	0.62	21.59	38.35	0.04	100.45	1.91	0.91	0.21	0.04	1.98	2.98	0.00	8.03	0.62	0.30	0.07	0.01	0.32	0.68
39	3558	29.56	7.82	2.50	0.59	21.68	38.77	0.00	100.88	1.91	0.90	0.21	0.04	1.97	2.99	0.00	8.02	0.63	0.29	0.07	0.01	0.32	0.68
40	3651	29.02	7.86	2.50	0.80	21.40	38.47	0.08	100.13	1.89	0.91	0.21	0.05	1.96	3.00	0.00	8.02	0.62	0.30	0.07	0.02	0.33	0.67
41	3745	29.64	7.80	2.55	0.78	21.98	38.64	0.00	101.36	1.91	0.90	0.21	0.05	1.99	2.97	0.00	8.03	0.62	0.29	0.07	0.02	0.32	0.68
42	3838	29.69	7.64	2.50	0.44	21.64	38.40	0.00	100.29	1.93	0.89	0.21	0.03	1.98	2.99	0.00	8.02	0.63	0.29	0.07	0.01	0.31	0.69
43	3932	29.14	7.42	2.56	0.75	21.15	38.56	0.03	99.60	1.91	0.87	0.21	0.05	1.95	3.02	0.00	8.01	0.63	0.28	0.07	0.02	0.31	0.69
44	4026	29.69	7.57	2.57	0.62	21.77	38.73	0.04	100.98	1.92	0.87	0.21	0.04	1.98	2.99	0.00	8.02	0.63	0.29	0.07	0.01	0.31	0.69
45	4119	29.63	7.78	2.48	0.88	21.62	38.46	0.00	100.73	1.92	0.90	0.21	0.06	1.97	2.98	0.00	8.03	0.62	0.29	0.07	0.02	0.32	0.68
46	4213	29.48	7.54	2.64	0.78	21.11	38.58	0.00	100.13	1.92	0.88	0.22	0.05	1.94	3.01	0.00	8.02	0.63	0.29	0.07	0.02	0.31	0.69
47	4307	28.84	7.68	2.61	1.00	21.56	39.04	0.00	100.67	1.86	0.88	0.22	0.07	1.96	3.01	0.00	8.00	0.62	0.29	0.07	0.02	0.32	0.68
48	4400	28.53	7.74	2.36	0.79	21.63	39.48	0.02	100.55	1.84	0.89	0.19	0.05	1.96	3.04	0.00	7.98	0.62	0.30	0.07	0.02	0.33	0.67
49	4494	29.31	7.39	2.72	0.95	21.39	38.50	0.03	100.29	1.91	0.86	0.23	0.06	1.96	3.00	0.00	8.02	0.62	0.28	0.07	0.02	0.31	0.69
50	4587	29.30	7.54	2.66	0.89	21.50	38.82	0.00	100.69	1.90	0.87	0.22	0.06	1.96	3.01	0.00	8.01	0.62	0.29	0.07	0.02	0.31	0.69
51	4681	28.56	7.81	2.68	0.98	21.24	38.36	0.02	99.64	1.87	0.91	0.22	0.06	1.96	3.00	0.00	8.02	0.61	0.30	0.07	0.02	0.33	0.67
52	4775	28.63	7.83	2.71	0.98	21.27	38.49	0.05	99.97	1.87	0.91	0.23	0.07	1.95	3.00	0.00	8.02	0.61	0.30	0.07	0.02	0.33	0.67
53	4868	28.54	7.89	2.68	0.84	21.60	38.49	0.10	100.13	1.86	0.91	0.22	0.06	1.98	2.99	0.01	8.02	0.61	0.30	0.07	0.02	0.33	0.67
54	4962	28.77	7.91	2.60	0.86	21.52	38.78	0.05	100.48	1.86	0.91	0.22	0.06	1.96	3.00	0.00	8.02	0.61	0.30	0.07	0.02	0.33	0.67
55	5055	28.75	7.86	2.49	0.67	21.44	38.79	0.17	100.16	1.87	0.91	0.21	0.04	1.96	3.01	0.01	8.01	0.62	0.30	0.07	0.01	0.33	0.67
56	5149	28.62	8.18	2.57	0.91	21.60	38.76	0.13	100.76	1.85	0.94	0.21	0.06	1.97	2.99	0.01	8.02	0.60	0.31	0.07	0.02	0.34	0.66
57	5243	28.81	7.98	2.41	0.88	21.54	38.76	0.00	100.37	1.87	0.92	0.20	0.06	1.97	3.00	0.00	8.01	0.61	0.30	0.07	0.02	0.33	0.67
58	5336	27.16	7.41	2.36	0.96	24.97	36.95	0.00	99.80	1.76	0.85	0.20	0.06	2.28	2.86	0.00	8.00	0.61	0.30	0.07	0.02	0.33	0.67
59	5430	27.85	8.02	2.55	0.84	21.74	38.74	0.03	99.77	1.81	0.93	0.21	0.06	1.99	3.01	0.00	8.00	0.60	0.31	0.07	0.02	0.34	0.66
61	5617	28.37	8.08	2.76	1.05	21.48	38.62	0.09	100.44	1.84	0.93	0.23	0.07	1.96	2.99	0.01	8.03	0.60	0.30	0.07	0.02	0.34	0.66
62	5711	28.54	8.21	2.76	1.11	21.73	38.93	0.01	101.29	1.83	0.94	0.23	0.07	1.97	2.99	0.00	8.03	0.60	0.31	0.07	0.02	0.34	0.66
63	5804	28.62	8.07	2.62	0.86	21.82	38.99	0.19	101.17	1.84	0.93	0.22	0.06	1.98	3.00	0.01	8.01	0.61	0.30	0.07	0.02	0.33	0.67
64	5898	28.11	7.92	2.61	1.09	21.99	39.23	0.02	100.98	1.80	0.91	0.21	0.07	1.99	3.01	0.00	8.00	0.60	0.30	0.07	0.02	0.33	0.67

65	5992	28.13	8.04	2.66	1.09	21.65	38.73	0.02	100.32	1.82	0.93	0.22	0.07	1.98	3.00	0.00	8.01	0.60	0.30	0.07	0.02	0.34	0.66
66	6085	28.06	8.06	2.74	1.12	21.43	38.38	0.00	99.72	1.83	0.94	0.23	0.07	1.97	2.99	0.00	8.03	0.60	0.31	0.07	0.02	0.34	0.66
67	6179	28.19	8.23	2.59	1.21	21.38	38.57	0.00	100.14	1.83	0.95	0.22	0.08	1.96	2.99	0.00	8.03	0.59	0.31	0.07	0.03	0.34	0.66
68	6273	27.94	7.80	2.82	1.22	21.29	38.64	0.05	99.75	1.82	0.91	0.24	0.08	1.96	3.01	0.00	8.01	0.60	0.30	0.08	0.03	0.33	0.67
69	6366	28.18	8.23	2.69	1.17	21.94	38.95	0.15	101.31	1.81	0.94	0.22	0.08	1.98	2.99	0.01	8.02	0.59	0.31	0.07	0.02	0.34	0.66
70	6460	28.45	7.97	2.79	1.21	21.62	38.72	0.09	100.84	1.84	0.92	0.23	0.08	1.97	2.99	0.01	8.02	0.60	0.30	0.08	0.03	0.33	0.67
71	6553	28.21	8.25	2.64	1.16	21.58	38.75	0.17	100.76	1.82	0.95	0.22	0.08	1.96	2.99	0.01	8.02	0.59	0.31	0.07	0.02	0.34	0.66
72	6647	28.47	8.22	2.62	1.10	21.89	38.82	0.00	101.12	1.83	0.94	0.22	0.07	1.98	2.98	0.00	8.03	0.60	0.31	0.07	0.02	0.34	0.66
73	6741	27.55	8.28	2.74	1.14	21.69	38.71	0.00	100.10	1.78	0.96	0.23	0.07	1.98	3.00	0.00	8.01	0.59	0.31	0.07	0.02	0.35	0.65
77	7115	28.24	8.23	2.71	1.08	21.53	38.50	0.08	100.35	1.83	0.95	0.23	0.07	1.97	2.99	0.00	8.03	0.59	0.31	0.07	0.02	0.34	0.66
78	7209	28.15	8.46	2.77	1.05	21.54	38.52	0.00	100.47	1.82	0.98	0.23	0.07	1.96	2.98	0.00	8.04	0.59	0.32	0.07	0.02	0.35	0.65
79	7302	28.12	8.31	2.60	0.98	21.61	38.79	0.04	100.45	1.82	0.96	0.22	0.06	1.97	3.00	0.00	8.02	0.60	0.31	0.07	0.02	0.34	0.66
82	7583	28.54	8.34	2.61	1.15	21.75	38.71	0.00	100.95	1.84	0.96	0.21	0.07	1.97	2.98	0.00	8.03	0.60	0.31	0.07	0.02	0.34	0.66
83	7677	28.19	8.35	2.47	0.99	21.37	38.35	0.00	99.64	1.83	0.97	0.20	0.07	1.96	2.98	0.00	8.03	0.59	0.31	0.067	0.02	0.34	0.65
84	7770	28.44	8.43	2.24	0.83	22.84	39.23	0.03	102.04	1.80	0.95	0.18	0.05	2.04	2.97	0.00	8.01	0.60	0.32	0.06	0.02	0.35	0.65
85	7864	28.82	8.27	2.48	0.98	21.75	39.08	0.05	101.44	1.85	0.94	0.20	0.06	1.97	3.00	0.00	8.02	0.60	0.31	0.07	0.02	0.34	0.66
89	8239	28.45	8.46	2.34	0.92	21.51	38.68	0.00	100.34	1.84	0.98	0.19	0.06	1.96	2.99	0.00	8.03	0.60	0.32	0.06	0.02	0.35	0.65
91	8426	28.74	8.26	2.31	0.85	21.59	38.46	0.01	100.22	1.87	0.96	0.19	0.06	1.98	2.98	0.00	8.03	0.61	0.31	0.06	0.02	0.34	0.66
92	8519	28.88	8.08	2.47	1.08	21.61	38.88	0.03	101.04	1.86	0.93	0.20	0.07	1.96	3.00	0.00	8.02	0.61	0.30	0.07	0.02	0.33	0.67
93	8613	28.73	8.58	2.40	0.90	21.58	38.83	0.04	101.05	1.85	0.98	0.20	0.06	1.96	2.99	0.00	8.03	0.60	0.32	0.06	0.02	0.35	0.65
94	8707	29.13	8.16	2.56	0.85	21.45	38.69	0.00	100.77	1.88	0.94	0.21	0.06	1.95	2.99	0.00	8.03	0.61	0.30	0.07	0.02	0.33	0.67
95	8800	28.56	8.41	2.35	0.82	21.21	38.65	0.01	100.00	1.86	0.97	0.20	0.05	1.94	3.00	0.00	8.03	0.60	0.32	0.06	0.02	0.34	0.66
97	8988	28.26	8.73	2.42	0.88	21.96	39.25	0.00	101.46	1.80	0.99	0.20	0.06	1.97	2.99	0.00	8.02	0.59	0.33	0.06	0.02	0.36	0.64
98	9081	28.29	8.14	2.33	0.87	21.29	38.55	0.09	99.56	1.85	0.95	0.20	0.06	1.96	3.01	0.01	8.01	0.61	0.31	0.06	0.02	0.34	0.66
99	9175	28.53	8.25	2.29	0.71	21.62	38.39	0.11	99.90	1.86	0.96	0.19	0.05	1.98	2.99	0.01	8.02	0.61	0.31	0.06	0.02	0.34	0.66
100	9268	28.89	8.34	2.41	0.79	21.94	39.04	0.17	101.58	1.85	0.95	0.20	0.05	1.98	2.99	0.01	8.02	0.61	0.31	0.06	0.02	0.34	0.66
101	9362	28.66	8.45	2.46	0.83	21.72	38.91	0.00	100.97	1.84	0.97	0.20	0.05	1.97	2.99	0.00	8.03	0.60	0.32	0.07	0.02	0.34	0.66
102	9456	28.40	8.39	2.40	0.62	21.38	38.51	0.08	99.79	1.85	0.97	0.20	0.04	1.96	3.00	0.00	8.02	0.60	0.32	0.07	0.01	0.34	0.66
103	9549	28.70	8.36	2.51	0.67	21.74	38.95	0.00	100.85	1.85	0.96	0.21	0.04	1.97	2.99	0.00	8.02	0.60	0.31	0.07	0.01	0.34	0.66
104	9643	28.24	8.43	2.40	0.69	21.58	38.88	0.10	100.32	1.83	0.97	0.20	0.05	1.97	3.01	0.01	8.01	0.60	0.32	0.07	0.01	0.35	0.65
105	9736	28.53	8.13	2.60	0.66	21.50	38.94	0.00	100.34	1.84	0.94	0.22	0.04	1.96	3.01	0.00	8.01	0.61	0.31	0.07	0.01	0.34	0.66
106	9830	28.50	8.30	2.74	0.75	21.73	38.81	0.01	100.83	1.84	0.95	0.23	0.05	1.97	2.99	0.00	8.02	0.60	0.31	0.07	0.02	0.34	0.66
107	9924	28.88	8.36	2.65	0.65	21.72	38.65	0.00	100.81	1.86	0.96	0.22	0.04	1.97	2.98	0.00	8.04	0.60	0.31	0.07	0.01	0.34	0.66
108	10017	28.11	8.23	2.62	0.66	21.51	38.56	0.00	99.64	1.83	0.95	0.22	0.04	1.97	3.00	0.00	8.02	0.60	0.31	0.07	0.01	0.34	0.66

109	10111	28.32	8.51	2.70	0.79	21.54	38.53	0.08	100.46	1.83	0.98	0.22	0.05	1.96	2.98	0.00	8.04	0.59	0.32	0.07	0.02	0.35	0.65
110	10205	28.63	8.12	2.56	0.67	21.45	38.47	0.07	99.96	1.86	0.94	0.21	0.04	1.97	2.99	0.00	8.02	0.61	0.31	0.07	0.01	0.34	0.66
111	10298	28.64	8.35	2.69	0.70	21.67	38.82	0.01	100.88	1.84	0.96	0.22	0.05	1.97	2.99	0.00	8.03	0.60	0.31	0.07	0.01	0.34	0.66
112	10392	28.81	8.10	2.56	0.61	21.52	38.47	0.04	100.11	1.87	0.94	0.21	0.04	1.97	2.99	0.00	8.02	0.61	0.31	0.07	0.01	0.33	0.67
113	10485	28.37	8.46	2.58	0.58	21.51	38.36	0.00	99.77	1.85	0.98	0.21	0.04	1.97	2.98	0.00	8.03	0.60	0.32	0.07	0.01	0.35	0.65
114	10579	28.28	8.25	2.68	0.57	21.43	38.52	0.05	99.78	1.84	0.96	0.22	0.04	1.97	3.00	0.00	8.02	0.60	0.31	0.07	0.01	0.34	0.66
115	10673	29.07	8.28	2.63	0.63	21.85	38.84	0.06	101.36	1.87	0.95	0.22	0.04	1.98	2.98	0.00	8.03	0.61	0.31	0.07	0.01	0.34	0.66
116	10766	28.16	8.40	2.32	0.46	21.50	38.60	0.00	99.35	1.83	0.98	0.19	0.03	1.97	3.00	0.00	8.01	0.60	0.32	0.06	0.01	0.35	0.65
117	10860	28.16	8.31	2.54	0.59	21.43	38.37	0.00	99.40	1.84	0.97	0.21	0.04	1.97	2.99	0.00	8.02	0.60	0.32	0.07	0.01	0.34	0.66
118	10954	29.12	8.40	2.23	0.57	21.72	38.82	0.07	100.93	1.88	0.96	0.18	0.04	1.97	2.99	0.00	8.02	0.61	0.31	0.06	0.01	0.34	0.66
119	11047	28.67	8.44	2.32	0.42	21.71	38.67	0.08	100.32	1.85	0.97	0.19	0.03	1.98	2.99	0.00	8.02	0.61	0.32	0.06	0.01	0.34	0.66
120	11141	28.45	8.14	2.42	0.46	21.46	38.42	0.00	99.30	1.86	0.95	0.20	0.03	1.98	3.00	0.00	8.01	0.61	0.31	0.07	0.01	0.34	0.66
121	11234	28.95	8.19	2.65	0.46	21.82	39.04	0.10	101.22	1.86	0.94	0.22	0.03	1.97	3.00	0.01	8.02	0.61	0.31	0.07	0.01	0.34	0.66
122	11328	28.82	8.33	2.47	0.58	21.72	38.93	0.02	100.87	1.86	0.96	0.20	0.04	1.97	3.00	0.00	8.02	0.61	0.31	0.07	0.01	0.34	0.66
123	11422	28.72	8.58	2.40	0.60	21.81	38.67	0.00	100.77	1.85	0.99	0.20	0.04	1.98	2.98	0.00	8.03	0.60	0.32	0.06	0.01	0.35	0.65
124	11515	29.45	8.40	2.44	0.48	21.66	39.14	0.00	101.52	1.89	0.96	0.20	0.03	1.95	3.00	0.00	8.03	0.61	0.31	0.07	0.01	0.34	0.66
125	11609	29.27	8.23	2.52	0.47	21.87	38.87	0.01	101.24	1.88	0.94	0.21	0.03	1.98	2.99	0.00	8.03	0.61	0.31	0.07	0.01	0.33	0.67
126	11703	28.48	8.05	2.45	0.48	21.21	38.57	0.00	99.23	1.86	0.94	0.21	0.03	1.95	3.02	0.00	8.01	0.61	0.31	0.07	0.01	0.34	0.66
127	11796	28.71	8.22	2.39	0.39	21.56	38.82	0.00	100.03	1.86	0.95	0.20	0.03	1.97	3.01	0.00	8.01	0.61	0.31	0.07	0.01	0.34	0.66
128	11890	28.49	8.40	2.46	0.50	21.71	38.84	0.13	100.53	1.84	0.97	0.20	0.03	1.98	3.00	0.01	8.01	0.60	0.32	0.07	0.01	0.34	0.66
129	11983	28.78	8.30	2.38	0.44	21.39	38.77	0.03	100.08	1.87	0.96	0.20	0.03	1.96	3.01	0.00	8.02	0.61	0.31	0.06	0.01	0.34	0.66
130	12077	28.61	8.43	2.39	0.40	21.93	38.58	0.05	100.39	1.85	0.97	0.20	0.03	2.00	2.98	0.00	8.02	0.61	0.32	0.07	0.01	0.34	0.66
131	12171	28.88	8.11	2.49	0.37	21.69	38.12	0.03	99.68	1.88	0.94	0.21	0.02	2.00	2.97	0.00	8.03	0.62	0.31	0.07	0.01	0.33	0.67
132	12264	28.84	8.15	2.31	0.32	21.48	38.60	0.07	99.76	1.88	0.95	0.19	0.02	1.97	3.01	0.00	8.00	0.62	0.31	0.06	0.01	0.34	0.66
133	12358	28.75	8.26	2.39	0.50	21.57	38.73	0.11	100.30	1.86	0.95	0.20	0.03	1.97	3.00	0.01	8.02	0.61	0.31	0.07	0.01	0.34	0.66
134	12451	28.64	8.38	2.44	0.40	21.71	38.67	0.00	100.22	1.85	0.97	0.20	0.03	1.98	2.99	0.00	8.02	0.61	0.32	0.07	0.01	0.34	0.66
135	12545	29.17	8.37	2.35	0.48	21.59	38.70	0.00	100.64	1.88	0.96	0.19	0.03	1.97	2.99	0.00	8.03	0.61	0.31	0.06	0.01	0.34	0.66
136	12639	28.70	8.30	2.34	0.51	21.52	38.42	0.00	99.74	1.87	0.96	0.20	0.03	1.97	2.99	0.00	8.02	0.61	0.31	0.06	0.01	0.34	0.66
137	12732	28.75	8.47	2.30	0.48	21.72	38.52	0.00	100.22	1.86	0.98	0.19	0.03	1.98	2.98	0.00	8.03	0.61	0.32	0.06	0.01	0.34	0.66
138	12826	28.61	8.41	2.32	0.70	21.34	38.67	0.00	99.99	1.86	0.97	0.19	0.05	1.95	3.00	0.00	8.02	0.61	0.32	0.06	0.01	0.34	0.66
139	12920	28.43	8.48	2.27	0.60	21.68	38.63	0.07	100.16	1.84	0.98	0.19	0.04	1.98	2.99	0.00	8.02	0.60	0.32	0.06	0.01	0.35	0.65
140	13013	28.25	8.49	2.11	0.69	21.59	38.89	0.00	99.93	1.83	0.98	0.18	0.05	1.97	3.01	0.00	8.01	0.60	0.32	0.06	0.01	0.35	0.65
141	13107	28.83	8.43	2.21	0.58	21.49	38.70	0.03	100.26	1.87	0.97	0.18	0.04	1.96	3.00	0.00	8.02	0.61	0.32	0.06	0.01	0.34	0.66
142	13200	28.75	8.33	2.23	0.70	21.53	38.24	0.00	99.71	1.87	0.97	0.19	0.05	1.98	2.98	0.00	8.03	0.61	0.31	0.06	0.01	0.34	0.66

143	13294	29.04	8.52	2.33	0.90	22.27	39.12	0.00	102.12	1.85	0.97	0.19	0.06	2.00	2.97	0.00	8.03	0.60	0.32	0.06	0.02	0.34	0.66
144	13388	28.89	8.14	2.14	0.74	21.64	38.72	0.03	100.31	1.87	0.94	0.18	0.05	1.98	3.00	0.00	8.01	0.62	0.31	0.06	0.02	0.33	0.67
145	13481	29.44	7.97	2.18	0.61	21.33	38.65	0.07	100.25	1.91	0.92	0.18	0.04	1.95	3.00	0.00	8.02	0.63	0.30	0.06	0.01	0.33	0.67
146	13575	29.74	7.88	2.29	0.94	21.82	38.14	0.00	100.77	1.93	0.91	0.19	0.06	1.99	2.96	0.00	8.04	0.62	0.29	0.06	0.02	0.32	0.68
147	13669	30.44	7.51	2.25	0.90	21.58	38.47	0.08	101.23	1.97	0.87	0.19	0.06	1.97	2.98	0.00	8.03	0.64	0.28	0.06	0.02	0.31	0.69
148	13762	30.65	6.45	2.27	0.97	20.96	37.23	0.04	98.57	2.05	0.77	0.19	0.07	1.98	2.98	0.00	8.03	0.67	0.25	0.06	0.02	0.27	0.73

Table 3.4b: Qualitative trace element analyses of Garnet I from specimen 11E2 along traverse C-D (Plate 5.3). Relative concentrations are measured in counts/second. **D** = distance from starting point C in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1194	2275	1547	1033	1989	47	3224	1215	2219	1475	1003	1749	97	6729	121	208	145	100	164
2	70	1116	2311	1554	1097	1861	48	3294	1178	2289	1534	1002	1734	98	6799	122	226	158	915	177
3	140	1068	2050	1500	1094	1783	49	3365	1157	2286	1514	933	1639	99	6869	123	219	154	989	165
5	280	1203	2098	1463	1093	1781	50	3435	1179	2175	1577	976	1734	104	7220	117	214	153	100	176
6	350	1119	2135	1478	987	1738	51	3505	1136	2172	1541	976	1842	105	7290	119	218	154	944	172
7	421	1136	2142	1469	1013	1724	52	3575	1188	2249	1499	1006	1694	106	7360	121	216	144	936	167
8	491	1135	2214	1397	976	1810	53	3645	1237	2125	1478	918	1719	107	7430	124	218	150	921	171
9	561	1092	2160	1458	931	1725	54	3715	1133	2137	1536	1007	1796	110	7640	112	218	154	984	180
10	631	1112	2096	1302	943	1826	56	3855	1489	2062	1421	977	1775	111	7710	120	205	151	860	174
11	701	1163	2083	1456	986	1788	57	3925	1197	2214	1544	960	1859	112	7781	116	215	151	100	174
12	771	1125	2166	1511	1018	1793	58	3995	1177	2090	1559	930	1726	113	7851	111	215	153	926	166
13	841	1157	2211	1467	996	1787	59	4066	1175	2195	1491	985	1753	115	7991	115	217	142	933	171
14	911	1201	2144	1456	976	1800	60	4136	1136	2115	1538	920	1794	120	8341	112	228	156	100	172
15	981	1162	2141	1565	1027	1783	61	4206	1240	2201	1488	973	1744	121	8411	121	216	153	102	170
16	1051	1152	2229	1483	1043	1745	63	4346	1172	2140	1527	945	1741	124	8622	119	222	153	942	176
17	1122	1219	2096	1513	998	1654	64	4416	1241	2147	1556	898	1686	125	8692	116	221	158	101	178
18	1192	1132	2203	1501	968	1743	65	4486	1184	2185	1553	944	1735	126	8762	124	223	156	934	169
19	1262	1138	1994	1567	1035	1766	66	4556	1184	2186	1638	1038	1778	127	8832	121	232	147	922	171
20	1332	1175	2211	1497	1002	1817	67	4626	1188	2207	1512	920	1787	128	8902	120	220	154	916	171
21	1402	1172	2188	1533	948	1733	68	4696	1204	2191	1571	913	1758	129	8972	117	226	151	994	173
22	1472	1216	2207	1508	1027	1754	69	4766	1134	2181	1572	955	1738	130	9042	113	216	148	902	167
23	1542	1066	2262	1472	1056	1761	70	4837	1124	2199	1483	947	1622	131	9112	115	223	152	943	168
24	1612	1225	2331	1477	948	1759	72	4977	1248	2180	1441	962	1766	134	9323	116	212	146	912	168
25	1682	1139	2169	1506	1037	1725	73	5047	1127	2132	1545	980	1777	135	9393	109	216	152	965	170
26	1752	1134	2111	1549	951	1731	74	5117	1209	2274	1460	923	1757	136	9463	116	218	153	864	170
27	1822	1130	2147	1572	1012	1696	75	5187	1224	2247	1459	940	1802	137	9533	122	224	157	969	177
28	1893	1195	2273	1542	971	1742	76	5257	1179	2233	1496	918	1683	138	9603	122	216	157	954	171
29	1963	1200	2131	1516	1014	1738	77	5327	1193	2261	1486	949	1666	139	9673	118	212	154	924	167
30	2033	1419	2223	1549	930	1714	78	5397	1171	2146	1557	928	1661	140	9743	118	216	144	961	166
32	2173	1131	2198	1491	1003	1783	79	5467	1131	2126	1521	962	1811	141	9813	112	217	154	996	177
33	2243	1161	2115	1559	887	1725	81	5608	1176	2124	1527	949	1666	142	9883	116	217	151	963	177
34	2313	1172	2179	1505	963	1749	82	5678	1213	2258	1529	919	1718	143	9953	113	217	155	936	170
35	2383	1224	2154	1490	926	1648	83	5748	1230	2234	1475	958	1729	144	10024	115	216	155	976	177
36	2453	1189	2287	1510	981	1740	84	5818	1221	2300	1518	944	1711	145	10094	111	195	122	903	144
37	2523	1116	2085	1460	936	1719	85	5888	1213	2225	1467	954	1562	147	10234	110	217	154	964	171
38	2594	1197	2262	1552	943	1808	87	6028	1191	2271	1457	1004	1765	148	10304	118	208	147	992	171
39	2664	1382	2296	1557	984	1677	88	6098	1252	2253	1437	941	1833	149	10374	115	221	160	973	170
40	2734	1217	2208	1536	953	1700	89	6168	1210	2268	1518	955	1771	150	10444	115	215	146	967	173
41	2804	1173	2302	1452	979	1749	90	6238	1229	2164	1491	958	1719	151	10514	112	217	144	940	170
42	2874	1135	2156	1505	945	1685	91	6309	1264	2145	1544	936	1756	152	10584	103	215	147	959	175
43	2944	1047	1938	1503	850	1694	93	6449	1156	2196	1519	950	1787	153	10654	120	216	157	970	172
44	3014	1182	2207	1489	966	1693	94	6519	1151	2214	1490	936	1810	154	10725	112	216	144	912	170
45	3084	1245	2068	1493	946	1725	95	6589	1186	2186	1465	904	1704	155	10795	118	213	153	937	174
46	3154	1225	2248	1542	968	1775	96	6659	1194	2158	1514	967	1688	156	10865	115	221	147	100	176

157	10935	1181	2308	1469	945	1679	173	12056	1386	2218	1502	922	1972	187	13038	115	220	138	995	157
158	11005	1143	2253	1470	958	1704	174	12126	1171	2267	1549	1004	1704	188	13108	110	201	130	963	148
160	11145	1166	2190	1550	1007	1759	175	12197	1129	2121	1449	982	1750	189	13178	113	230	142	106	181
162	11285	1175	2220	1437	966	1690	176	12267	1102	2070	1547	960	1745	190	13248	116	226	147	966	177
163	11355	1156	2124	1551	973	1712	177	12337	1155	2102	1460	991	1822	191	13318	112	217	146	105	170
164	11425	1138	2190	1446	944	1695	178	12407	1125	2113	1547	1042	1726	192	13388	111	222	145	101	178
165	11496	1169	2152	1512	961	1755	180	12547	1201	2211	1453	997	1723	193	13458	108	228	151	103	172
166	11566	1226	2216	1507	952	1735	181	12617	1164	2216	1534	997	1693	194	13528	114	211	151	103	175
168	11706	1100	2285	1529	1013	1733	182	12687	1120	2166	1544	994	1645	195	13598	115	219	145	104	175
170	11846	1097	2218	1498	989	1722	183	12757	1151	2142	1509	1012	1685	196	13669	119	221	151	109	174
171	11916	1095	2129	1567	947	1767	184	12827	1102	2188	1483	1027	1717	197	13739	113	214	149	102	185
172	11986	1219	2168	1559	951	1726	186	12968	1113	2120	1538	997	1732							

Table 3.5a: Composition of Garnet II from specimen 11E1 as analyzed along traverse A-B (Plate 5.4). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	32.89	7.02	0.41	0.83	22.02	37.19	0.02	100.36	2.17	0.82	0.03	0.06	2.04	2.93	0.00	8.05	0.70	0.27	0.01	0.02	0.72	0.28
2	46	32.28	7.28	0.55	0.93	21.74	37.53	0.11	100.32	2.12	0.85	0.05	0.06	2.01	2.95	0.01	8.04	0.69	0.28	0.02	0.02	0.71	0.29
3	91	31.55	7.37	0.66	0.96	21.82	37.48	0.07	99.83	2.08	0.86	0.06	0.06	2.02	2.95	0.00	8.04	0.68	0.28	0.02	0.02	0.71	0.29
4	137	31.12	7.73	0.81	0.87	21.74	36.75	0.09	99.04	2.07	0.92	0.07	0.06	2.04	2.92	0.01	8.06	0.66	0.29	0.02	0.02	0.69	0.31
7	274	30.74	7.45	0.89	0.88	21.64	37.60	0.05	99.19	2.03	0.88	0.08	0.06	2.01	2.97	0.00	8.02	0.67	0.29	0.02	0.02	0.70	0.30
8	319	31.18	7.25	0.89	0.92	21.31	37.84	0.00	99.39	2.06	0.85	0.08	0.06	1.98	2.99	0.00	8.02	0.68	0.28	0.02	0.02	0.71	0.29
9	365	31.22	7.54	0.94	0.87	21.64	37.74	0.02	99.95	2.05	0.88	0.08	0.06	2.00	2.96	0.00	8.04	0.67	0.29	0.03	0.02	0.70	0.30
10	411	30.43	7.40	0.84	0.94	21.55	35.97	0.01	97.14	2.06	0.89	0.07	0.06	2.06	2.91	0.00	8.06	0.67	0.29	0.02	0.02	0.70	0.30
11	456	31.67	7.88	0.99	0.94	22.01	37.99	0.04	101.48	2.05	0.91	0.08	0.06	2.01	2.94	0.00	8.05	0.66	0.29	0.03	0.02	0.69	0.31
12	502	30.32	8.01	0.90	0.79	21.60	37.51	0.00	99.12	2.00	0.94	0.08	0.05	2.01	2.96	0.00	8.04	0.65	0.31	0.02	0.02	0.68	0.32
13	547	31.12	7.89	0.94	0.83	21.65	37.95	0.00	100.38	2.03	0.92	0.08	0.05	1.99	2.96	0.00	8.04	0.66	0.30	0.03	0.02	0.69	0.31
14	593	31.04	7.88	0.91	0.96	21.99	37.88	0.11	100.66	2.02	0.91	0.08	0.06	2.02	2.95	0.01	8.04	0.66	0.30	0.02	0.02	0.69	0.31
16	639	30.37	7.88	0.74	0.95	21.80	37.56	0.16	99.31	2.00	0.93	0.06	0.06	2.02	2.96	0.01	8.03	0.66	0.30	0.02	0.02	0.68	0.32
17	684	29.79	8.10	0.92	0.85	21.64	38.05	0.02	99.34	1.95	0.95	0.08	0.06	2.00	2.98	0.00	8.02	0.64	0.31	0.03	0.02	0.67	0.33
18	730	30.26	8.15	0.74	0.98	21.65	37.79	0.00	99.57	1.99	0.95	0.06	0.06	2.00	2.97	0.00	8.03	0.65	0.31	0.02	0.02	0.68	0.32
19	776	30.64	8.16	0.71	0.97	21.91	37.73	0.06	100.12	2.00	0.95	0.06	0.06	2.02	2.95	0.00	8.04	0.65	0.31	0.02	0.02	0.68	0.32
20	867	30.56	8.14	0.78	0.92	21.49	38.00	0.12	99.89	2.00	0.95	0.07	0.06	1.98	2.97	0.01	8.03	0.65	0.31	0.02	0.02	0.68	0.32
21	912	29.97	8.09	0.70	0.80	21.77	37.48	0.43	99.23	1.97	0.95	0.06	0.05	2.02	2.95	0.03	8.02	0.65	0.31	0.02	0.02	0.68	0.32
22	958	30.14	8.38	0.77	0.94	21.92	37.08	0.08	99.22	1.99	0.98	0.07	0.06	2.04	2.92	0.00	8.06	0.64	0.32	0.02	0.02	0.67	0.33
23	1004	30.29	8.55	0.81	0.96	22.16	38.24	0.06	101.01	1.96	0.98	0.07	0.06	2.02	2.95	0.00	8.04	0.64	0.32	0.02	0.02	0.67	0.33
24	1049	29.78	8.35	0.81	1.09	22.29	38.08	0.00	100.39	1.93	0.97	0.07	0.07	2.04	2.95	0.00	8.03	0.64	0.32	0.02	0.02	0.67	0.33
25	1095	29.91	8.28	0.85	0.79	21.53	37.66	0.18	99.21	1.97	0.97	0.07	0.05	2.00	2.96	0.01	8.03	0.64	0.32	0.02	0.02	0.67	0.33
26	1141	30.05	8.51	0.89	0.99	21.83	37.74	0.07	100.02	1.96	0.99	0.07	0.07	2.01	2.95	0.00	8.05	0.63	0.32	0.02	0.02	0.66	0.34
27	1186	30.18	8.31	0.89	0.94	21.87	38.34	0.00	100.53	1.96	0.96	0.07	0.06	2.00	2.97	0.00	8.03	0.64	0.31	0.02	0.02	0.67	0.33
28	1232	29.84	8.49	0.71	0.97	22.78	37.98	0.09	100.77	1.93	0.98	0.06	0.06	2.07	2.93	0.01	8.03	0.64	0.32	0.02	0.02	0.66	0.34
29	1277	30.00	8.65	0.91	0.97	21.75	38.06	0.00	100.34	1.95	1.00	0.08	0.06	1.99	2.96	0.00	8.04	0.63	0.32	0.02	0.02	0.66	0.34
30	1323	30.33	8.57	0.79	1.06	21.87	38.37	0.00	101.00	1.96	0.99	0.07	0.07	1.99	2.96	0.00	8.04	0.64	0.32	0.02	0.02	0.66	0.34

31	1369	30.36	8.36	0.76	1.06	22.17	38.12	0.00	100.82	1.97	0.96	0.06	0.07	2.02	2.95	0.00	8.04	0.64	0.31	0.02	0.02	0.67	0.33
32	1414	30.27	8.25	0.77	1.00	21.50	38.04	0.15	99.83	1.98	0.96	0.06	0.07	1.98	2.98	0.01	8.03	0.64	0.31	0.02	0.02	0.67	0.33
34	1505	29.98	8.49	0.72	0.94	21.68	38.11	0.25	100.17	1.95	0.98	0.06	0.06	1.99	2.97	0.01	8.03	0.64	0.32	0.02	0.02	0.66	0.34
35	1551	30.08	8.53	0.65	0.90	21.89	38.45	0.00	100.48	1.95	0.98	0.05	0.06	2.00	2.98	0.00	8.02	0.64	0.32	0.02	0.02	0.66	0.34
36	1597	30.56	8.37	0.82	1.06	21.97	37.53	0.10	100.31	2.00	0.97	0.07	0.07	2.02	2.93	0.01	8.06	0.64	0.31	0.02	0.02	0.67	0.33
38	1688	30.27	8.44	0.76	1.05	21.74	37.76	0.01	100.01	1.98	0.98	0.06	0.07	2.00	2.95	0.00	8.05	0.64	0.32	0.02	0.02	0.67	0.33
39	1734	30.26	8.44	0.65	1.00	21.74	37.91	0.02	100.01	1.98	0.98	0.05	0.07	2.00	2.96	0.00	8.04	0.64	0.32	0.02	0.02	0.67	0.33
40	1779	30.81	8.34	0.61	1.07	21.82	37.96	0.00	100.61	2.00	0.97	0.05	0.07	2.00	2.95	0.00	8.05	0.65	0.31	0.02	0.02	0.67	0.33
41	1825	30.26	8.68	0.77	0.98	22.07	38.23	0.00	100.99	1.95	1.00	0.06	0.06	2.01	2.95	0.00	8.04	0.63	0.32	0.02	0.02	0.66	0.34
42	1870	30.80	8.34	0.75	0.99	22.09	38.02	0.05	100.98	2.00	0.96	0.06	0.06	2.02	2.95	0.00	8.05	0.65	0.31	0.02	0.02	0.67	0.33
43	1946	30.36	8.33	0.65	1.05	21.82	38.15	0.11	100.37	1.98	0.97	0.05	0.07	2.00	2.97	0.01	8.03	0.64	0.32	0.02	0.02	0.67	0.33
44	1962	30.27	8.48	0.68	0.96	21.72	37.91	0.00	100.02	1.98	0.99	0.06	0.06	2.00	2.96	0.00	8.04	0.64	0.32	0.02	0.02	0.67	0.33
45	2007	31.16	8.31	0.54	0.89	21.67	38.23	0.00	100.80	2.02	0.96	0.05	0.06	1.98	2.97	0.00	8.04	0.66	0.31	0.01	0.02	0.68	0.32
46	2053	30.74	8.55	0.60	1.03	21.80	38.08	0.02	100.82	1.99	0.99	0.05	0.07	1.99	2.95	0.00	8.05	0.64	0.32	0.02	0.02	0.67	0.33
47	2099	30.54	8.19	0.61	0.92	21.63	38.01	0.05	99.90	2.00	0.96	0.05	0.06	1.99	2.97	0.00	8.03	0.65	0.31	0.02	0.02	0.68	0.32
48	2144	30.78	8.48	0.66	0.98	22.02	37.82	0.23	100.97	2.00	0.98	0.05	0.06	2.01	2.93	0.01	8.05	0.65	0.32	0.02	0.02	0.67	0.33
49	2190	30.28	8.04	0.61	0.86	22.02	38.17	0.01	99.98	1.97	0.93	0.05	0.06	2.02	2.98	0.00	8.01	0.65	0.31	0.02	0.02	0.68	0.32
50	2235	30.75	7.97	0.62	1.08	21.73	37.74	0.00	99.89	2.02	0.93	0.05	0.07	2.01	2.96	0.00	8.04	0.66	0.30	0.02	0.02	0.68	0.32
51	2281	30.73	8.08	0.64	0.74	21.80	37.75	0.02	99.74	2.01	0.94	0.05	0.05	2.01	2.96	0.00	8.03	0.66	0.31	0.02	0.02	0.68	0.32
52	2327	30.83	8.03	0.64	1.08	21.51	37.23	0.09	99.31	2.04	0.95	0.05	0.07	2.00	2.94	0.01	8.06	0.66	0.30	0.02	0.02	0.68	0.32
53	2372	30.62	8.22	0.57	0.87	21.83	38.24	0.00	100.36	1.99	0.95	0.05	0.06	2.00	2.97	0.00	8.03	0.65	0.31	0.02	0.02	0.68	0.32
54	2418	30.56	8.33	0.68	1.11	22.07	37.93	0.08	100.68	1.98	0.96	0.06	0.07	2.02	2.95	0.00	8.04	0.64	0.31	0.02	0.02	0.67	0.33
55	2463	30.56	8.22	0.55	0.96	22.15	38.37	0.08	100.81	1.98	0.95	0.05	0.06	2.02	2.97	0.00	8.02	0.65	0.31	0.02	0.02	0.68	0.32
56	2509	30.77	8.31	0.59	0.82	22.03	38.08	0.06	100.59	2.00	0.96	0.05	0.05	2.02	2.96	0.00	8.04	0.65	0.31	0.02	0.02	0.67	0.33
57	2555	30.99	8.41	0.69	1.07	22.30	38.39	0.11	101.85	1.99	0.96	0.06	0.07	2.02	2.95	0.01	8.04	0.65	0.31	0.02	0.02	0.67	0.33
58	2600	31.01	7.98	0.62	0.86	21.68	38.00	0.05	100.14	2.03	0.93	0.05	0.06	2.00	2.97	0.00	8.03	0.66	0.30	0.02	0.02	0.69	0.31
59	2646	30.60	8.13	0.72	1.03	21.64	37.82	0.06	99.93	2.00	0.95	0.06	0.07	2.00	2.96	0.00	8.04	0.65	0.31	0.02	0.02	0.68	0.32
60	2692	30.42	8.39	0.68	1.10	21.78	38.12	0.08	100.49	1.98	0.97	0.06	0.07	2.00	2.96	0.00	8.04	0.64	0.32	0.02	0.02	0.67	0.33
61	2737	30.59	8.17	0.66	1.06	21.64	37.09	0.00	99.22	2.02	0.96	0.06	0.07	2.02	2.93	0.00	8.06	0.65	0.31	0.02	0.02	0.68	0.32
62	2783	30.63	8.24	0.75	0.95	21.86	37.84	0.00	100.27	2.00	0.96	0.06	0.06	2.01	2.95	0.00	8.04	0.65	0.31	0.02	0.02	0.68	0.32
63	2828	30.28	8.14	0.78	1.06	21.62	37.47	0.00	99.36	1.99	0.96	0.07	0.07	2.01	2.95	0.00	8.05	0.65	0.31	0.02	0.02	0.68	0.32
64	2874	30.44	8.45	0.79	1.23	21.80	37.90	0.00	100.91	1.98	0.98	0.07	0.08	1.99	2.94	0.00	8.08	0.64	0.32	0.02	0.03	0.67	0.33
66	2965	29.96	8.21	0.78	0.92	21.68	37.56	0.19	99.29	1.97	0.96	0.07	0.06	2.01	2.95	0.01	8.03	0.64	0.31	0.02	0.02	0.67	0.33
67	3011	30.60	8.38	0.76	0.95	22.15	38.04	0.00	100.86	1.98	0.97	0.06	0.06	2.02	2.95	0.00	8.04	0.64	0.31	0.02	0.02	0.67	0.33

68	3057	30.54	8.08	0.80	0.90	21.85	37.86	0.00	100.02	2.00	0.94	0.07	0.06	2.01	2.96	0.00	8.03	0.65	0.31	0.02	0.02	0.68	0.32
69	3102	30.22	8.31	0.75	0.94	22.01	37.84	0.15	100.07	1.97	0.97	0.06	0.06	2.02	2.95	0.01	8.04	0.64	0.32	0.02	0.02	0.67	0.33
71	3193	30.38	8.07	0.79	0.97	21.88	37.84	0.06	99.93	1.99	0.94	0.07	0.06	2.02	2.96	0.00	8.03	0.65	0.31	0.02	0.02	0.68	0.32
72	3239	30.98	8.37	0.69	1.08	22.28	38.16	0.06	101.55	2.00	0.96	0.06	0.07	2.02	2.94	0.00	8.05	0.65	0.31	0.02	0.02	0.67	0.33
73	3285	30.20	8.45	0.62	1.13	21.81	37.78	0.03	100.30	1.97	0.98	0.05	0.07	2.00	2.95	0.00	8.08	0.64	0.32	0.02	0.02	0.67	0.33
74	3330	30.18	8.34	0.72	1.00	21.81	37.35	0.03	99.39	1.99	0.98	0.06	0.07	2.02	2.94	0.00	8.05	0.64	0.32	0.02	0.02	0.67	0.33
75	3376	30.25	8.04	0.68	0.96	21.87	37.62	0.09	99.41	1.99	0.94	0.06	0.06	2.03	2.96	0.01	8.03	0.65	0.31	0.02	0.02	0.68	0.32
76	3422	30.42	7.92	0.65	0.80	21.80	37.51	0.24	99.34	2.00	0.93	0.05	0.05	2.02	2.95	0.01	8.02	0.66	0.31	0.02	0.02	0.68	0.32
79	3558	31.36	7.88	0.78	1.04	21.78	38.07	0.02	100.90	2.04	0.91	0.06	0.07	2.00	2.96	0.00	8.04	0.66	0.30	0.02	0.02	0.69	0.31
80	3604	30.54	8.08	0.69	0.98	21.67	37.40	0.00	99.35	2.01	0.95	0.06	0.07	2.01	2.95	0.00	8.05	0.65	0.31	0.02	0.02	0.68	0.32
81	3650	31.16	7.99	0.64	0.90	21.93	37.86	0.08	100.48	2.03	0.93	0.05	0.06	2.02	2.95	0.00	8.04	0.66	0.30	0.02	0.02	0.69	0.31
82	3695	30.85	7.73	0.78	1.04	21.44	37.25	0.00	99.09	2.04	0.91	0.07	0.07	2.00	2.95	0.00	8.05	0.66	0.30	0.02	0.02	0.69	0.31
83	3741	31.18	7.86	0.65	0.88	21.68	38.01	0.00	100.26	2.04	0.92	0.05	0.06	2.00	2.97	0.00	8.03	0.66	0.30	0.02	0.02	0.69	0.31
84	3786	31.43	7.75	0.72	0.87	21.97	37.57	0.06	100.30	2.06	0.90	0.06	0.06	2.03	2.94	0.00	8.05	0.67	0.29	0.02	0.02	0.69	0.31
85	3832	31.23	7.82	0.63	1.13	22.43	38.42	0.02	101.68	2.01	0.90	0.05	0.07	2.03	2.96	0.00	8.03	0.66	0.30	0.02	0.02	0.69	0.31
86	3878	31.54	8.09	0.77	0.88	21.84	37.42	0.00	100.53	2.06	0.94	0.06	0.06	2.01	2.93	0.00	8.07	0.66	0.30	0.02	0.02	0.69	0.31
87	3923	31.58	7.98	0.68	0.77	21.99	37.68	0.00	100.69	2.06	0.93	0.06	0.05	2.02	2.94	0.00	8.05	0.67	0.30	0.02	0.02	0.69	0.31
88	3969	31.44	7.75	0.60	0.94	21.85	37.63	0.01	100.21	2.06	0.91	0.05	0.06	2.02	2.95	0.00	8.04	0.67	0.29	0.02	0.02	0.69	0.31
89	4015	31.47	7.63	0.71	1.08	22.05	38.06	0.00	100.99	2.04	0.88	0.06	0.07	2.02	2.96	0.00	8.03	0.67	0.29	0.02	0.02	0.70	0.30
90	4060	31.54	7.82	0.69	1.12	21.97	37.60	0.15	100.73	2.06	0.91	0.06	0.07	2.02	2.93	0.01	8.06	0.66	0.29	0.02	0.02	0.69	0.31
92	4151	32.02	7.73	0.65	0.92	21.82	38.00	0.00	101.16	2.08	0.90	0.05	0.06	2.00	2.95	0.00	8.05	0.67	0.29	0.02	0.02	0.70	0.30
93	4197	31.81	7.51	0.57	0.83	21.69	37.85	0.06	100.26	2.08	0.88	0.05	0.06	2.00	2.97	0.00	8.03	0.68	0.29	0.02	0.02	0.70	0.30
94	4243	31.98	7.47	0.54	1.08	21.52	37.70	0.00	100.28	2.10	0.87	0.05	0.07	1.99	2.96	0.00	8.04	0.68	0.28	0.01	0.02	0.71	0.29
95	4288	31.69	7.32	0.59	1.03	21.85	37.62	0.13	100.11	2.08	0.86	0.05	0.07	2.02	2.95	0.01	8.03	0.68	0.28	0.02	0.02	0.71	0.29
96	4334	32.81	7.66	0.58	0.90	22.05	37.79	0.00	101.81	2.13	0.89	0.05	0.06	2.01	2.93	0.00	8.06	0.68	0.28	0.02	0.02	0.71	0.29
97	4380	32.03	7.40	0.44	0.95	21.76	37.82	0.00	100.40	2.10	0.86	0.04	0.06	2.01	2.96	0.00	8.03	0.69	0.28	0.01	0.02	0.71	0.29
100	4516	32.69	6.70	0.51	0.99	21.49	37.32	0.00	99.70	2.17	0.79	0.04	0.07	2.01	2.96	0.00	8.04	0.71	0.26	0.01	0.02	0.73	0.27

Table 3.5b: Qualitative trace element analyses of Garnet II from specimen 11E1 along traverse A-B (Plate 5.4). Relative concentrations are measured in counts/second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P
1	0	1122	2546	1556	961	1961	50	2235	1268	2481	1589	1019	1952	96	4333	1247	2733	1661	1090	1988
2	46	2019	2621	1430	1098	1970	51	2281	1208	2652	1524	1022	1931	97	4379	1227	2760	1603	1095	1949
3	91	2636	2525	1500	1106	1940	52	2326	1217	2641	1657	1045	1864	98	4424	1199	2625	1560	1108	1934
4	137	1273	2488	1544	1128	2012	53	2372	1230	2767	1564	1037	1916	99	4470	1378	2640	1643	1069	1906
5	182	1115	2040	1258	890	1707	54	2417	1188	2549	1509	970	1848	100	4515	1656	2659	1605	1154	1877
7	274	2242	2644	1522	1078	2012	55	2463	1197	2582	1552	1038	1864							
8	319	1355	2500	1566	1079	2000	56	2509	1137	2524	1532	1031	1939							
9	365	1781	2044	1426	903	2588	57	2554	1220	2521	1586	982	1956							
10	410	1227	2552	1548	1086	1980	58	2600	1230	2487	1503	961	1923							
11	456	1213	2597	1554	1059	1927	59	2645	1323	2471	1550	1016	1931							
12	502	1251	2590	1506	1051	2025	60	2691	1188	2508	1519	995	1951							
13	547	1233	2537	1541	989	1915	61	2737	1326	2445	1520	1031	1941							
14	593	1183	2561	1489	969	2060	62	2782	1348	2482	1508	1041	1942							
15	639	1361	2661	1477	1019	2030	63	2828	1219	2475	1542	1003	2103							
16	684	1656	2590	1513	974	2177	64	2873	1181	2528	1622	1041	1910							
18	775	1354	2592	1522	1040	2015	65	2919	1139	2534	1510	987	2283							
19	821	1248	2592	1496	994	2020	66	2965	1363	2483	1718	862	2414							
20	867	1194	2705	1490	997	1860	67	3010	1268	2548	1406	988	1782							
21	912	1216	2907	1472	1000	1897	68	3056	1159	2668	1453	965	2226							
22	958	1254	2726	1540	1001	2107	69	3101	1198	2648	1474	987	2232							
23	1003	1207	2560	1434	937	2254	70	3147	1206	2709	1551	1046	2001							
24	1049	1219	2598	1477	969	2054	71	3193	1231	2683	1508	1032	2024							
25	1095	1426	2419	1593	1005	1934	72	3238	1150	2679	1515	989	2007							
27	1186	1323	2536	1487	1003	1938	73	3284	1188	2498	1486	1051	2044							
28	1231	1335	2522	1548	1045	1966	74	3330	1218	2517	1569	1011	2001							
29	1277	1309	2578	1463	970	2079	75	3375	1226	2495	1597	975	1973							
30	1323	1286	2760	1508	1044	1882	76	3421	1213	2511	1594	1141	1993							
31	1368	1182	2677	1502	1001	1917	77	3466	1248	2448	1557	1042	2227							
32	1414	1274	2672	1523	968	1898	78	3512	1416	2598	1585	1045	1967							
33	1460	1666	2626	1538	995	1928	79	3558	1582	2420	1575	1023	2337							
36	1596	1304	2552	1496	995	1964	81	3649	1231	2513	1547	1022	2172							
37	1642	1344	2602	1567	1027	1903	82	3694	1207	2461	1584	1013	1942							
38	1688	1237	2534	1569	1024	1846	83	3740	1204	2473	1611	1081	2075							
39	1733	1319	2504	1478	930	2024	84	3786	1195	2499	1568	1050	1910							
40	1779	1183	2428	1582	960	1947	86	3877	1426	2517	1588	1008	2023							
41	1824	1198	2532	1499	994	1980	87	3922	1219	2532	1623	1003	2031							
42	1870	1182	2563	1519	1075	1871	88	3968	1158	2515	1554	1098	1962							
43	1916	1428	2533	1530	1001	1911	89	4014	1263	2555	1594	1105	1955							
44	1961	1177	2526	1520	1013	1982	90	4059	1232	2582	1569	1092	1981							
45	2007	1234	2541	1519	1045	1934	91	4105	1230	2602	1575	1054	1985							
46	2052	1273	2698	1497	1064	1865	92	4151	1505	2735	1570	1164	1955							
47	2098	1175	2789	1513	994	1997	93	4196	1199	2645	1646	1032	2072							
48	2144	1262	2620	1470	957	1970	94	4242	1207	2642	1631	1052	1922							
49	2189	1208	2564	1655	958	2124	95	4287	1225	2796	1624	1064	1991							

Table 3.6a: Composition of Garnet II from specimen 11E1 as analyzed along traverse C-D (Plate 5.4). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	33.13	6.80	0.49	0.82	21.93	37.97	0.00	101.15	2.16	0.79	0.04	0.05	2.02	2.96	0.00	8.03	0.71	0.26	0.01	0.02	0.73	0.27
2	52	32.92	6.91	0.56	1.11	21.87	37.54	0.15	100.93	2.16	0.81	0.05	0.07	2.02	2.94	0.01	8.05	0.70	0.26	0.02	0.02	0.73	0.27
3	104	32.51	6.97	0.65	0.98	21.42	37.75	0.00	100.28	2.14	0.82	0.05	0.07	1.99	2.97	0.00	8.04	0.70	0.27	0.02	0.02	0.72	0.28
5	208	32.71	7.40	0.77	0.93	21.75	38.14	0.02	101.70	2.12	0.86	0.06	0.06	1.99	2.96	0.00	8.05	0.68	0.28	0.02	0.02	0.71	0.29
6	261	31.83	7.25	0.86	1.05	21.69	37.93	0.00	100.61	2.08	0.85	0.07	0.07	2.00	2.97	0.00	8.03	0.68	0.28	0.02	0.02	0.71	0.29
7	313	31.51	7.26	0.94	0.88	21.60	37.98	0.05	100.17	2.07	0.85	0.08	0.06	2.00	2.98	0.00	8.02	0.68	0.28	0.03	0.02	0.71	0.29
8	365	31.73	7.13	1.08	0.86	21.77	38.01	0.00	100.58	2.07	0.83	0.09	0.06	2.01	2.97	0.00	8.03	0.68	0.27	0.03	0.02	0.71	0.29
11	521	31.38	7.45	1.12	0.95	21.68	37.82	0.00	100.40	2.05	0.87	0.09	0.06	2.00	2.96	0.00	8.04	0.67	0.28	0.03	0.02	0.70	0.30
12	573	30.77	7.34	1.12	0.94	21.56	37.87	0.00	99.59	2.02	0.86	0.09	0.06	2.00	2.98	0.00	8.02	0.67	0.28	0.03	0.02	0.70	0.30
13	625	31.13	7.49	0.97	1.06	21.93	38.17	0.03	100.74	2.03	0.87	0.08	0.07	2.01	2.97	0.00	8.03	0.67	0.29	0.03	0.02	0.70	0.30
14	677	30.91	7.66	1.11	0.88	21.59	37.79	0.03	99.94	2.03	0.90	0.09	0.06	2.00	2.96	0.00	8.04	0.66	0.29	0.03	0.02	0.69	0.31
15	730	31.36	7.56	1.02	0.96	21.65	38.01	0.00	100.56	2.05	0.88	0.09	0.06	1.99	2.97	0.00	8.04	0.67	0.29	0.03	0.02	0.70	0.30
17	834	31.39	7.77	1.04	0.98	21.77	38.14	0.12	101.09	2.04	0.90	0.09	0.06	1.99	2.96	0.01	8.04	0.66	0.29	0.03	0.02	0.69	0.31
18	886	30.70	7.61	1.09	0.84	21.73	37.91	0.00	99.87	2.01	0.89	0.09	0.06	2.01	2.97	0.00	8.03	0.66	0.29	0.03	0.02	0.69	0.31
19	938	30.87	7.84	1.27	0.88	21.93	38.07	0.04	100.85	2.01	0.91	0.11	0.06	2.01	2.96	0.00	8.04	0.65	0.30	0.03	0.02	0.69	0.31
20	990	30.89	8.00	1.09	0.96	21.91	37.95	0.13	100.79	2.01	0.93	0.09	0.06	2.01	2.95	0.01	8.05	0.65	0.30	0.03	0.02	0.68	0.32
21	1042	30.38	7.75	1.09	0.86	22.26	38.83	0.00	101.17	1.96	0.89	0.09	0.06	2.02	2.99	0.00	8.00	0.65	0.30	0.03	0.02	0.69	0.31
22	1094	30.12	7.50	1.07	1.09	21.82	37.90	0.00	99.65	1.98	0.88	0.09	0.07	2.02	2.97	0.00	8.02	0.66	0.29	0.03	0.02	0.69	0.31
23	1146	30.48	7.84	1.01	1.03	21.99	38.13	0.02	100.48	1.98	0.91	0.08	0.07	2.02	2.97	0.00	8.03	0.65	0.30	0.03	0.02	0.69	0.31
24	1199	30.40	8.10	0.98	0.99	21.91	38.20	0.07	100.89	1.97	0.94	0.08	0.06	2.00	2.96	0.00	8.06	0.65	0.31	0.03	0.02	0.68	0.32
30	1511	30.16	8.52	0.70	0.97	22.95	39.26	0.00	102.56	1.91	0.96	0.06	0.06	2.05	2.97	0.00	8.01	0.64	0.32	0.02	0.02	0.67	0.33
31	1563	30.23	8.29	0.90	0.85	21.93	38.50	0.00	100.71	1.96	0.96	0.07	0.06	2.00	2.98	0.00	8.02	0.64	0.31	0.02	0.02	0.67	0.33
32	1615	30.55	8.18	0.92	0.91	21.88	38.45	0.05	100.89	1.98	0.94	0.08	0.06	2.00	2.98	0.00	8.03	0.65	0.31	0.02	0.02	0.68	0.32
33	1668	29.92	8.40	0.76	1.09	22.15	38.14	0.06	100.46	1.94	0.97	0.06	0.07	2.02	2.96	0.00	8.03	0.64	0.32	0.02	0.02	0.67	0.33
34	1720	31.05	8.39	0.69	1.00	22.15	38.78	0.08	102.06	1.99	0.96	0.06	0.06	2.00	2.97	0.00	8.03	0.65	0.31	0.02	0.02	0.68	0.32
46	2345	29.55	8.23	0.65	1.06	21.69	38.04	0.00	99.22	1.94	0.96	0.05	0.07	2.01	2.98	0.00	8.01	0.64	0.32	0.02	0.02	0.67	0.33
47	2397	29.94	8.43	0.63	0.84	21.70	37.94	0.00	99.48	1.96	0.98	0.05	0.06	2.00	2.97	0.00	8.03	0.64	0.32	0.02	0.02	0.67	0.33
48	2449	29.66	8.42	0.67	1.15	21.54	38.10	0.00	99.55	1.94	0.98	0.06	0.08	1.99	2.98	0.00	8.02	0.64	0.32	0.02	0.02	0.66	0.34

49	2501	30.32	8.19	0.67	1.11	21.91	38.12	0.00	100.33	1.97	0.95	0.06	0.07	2.01	2.97	0.00	8.03	0.65	0.31	0.02	0.02	0.67	0.33
50	2553	30.22	8.63	0.66	1.08	22.21	38.44	0.00	101.24	1.95	0.99	0.05	0.07	2.01	2.96	0.00	8.03	0.64	0.32	0.02	0.02	0.66	0.34
51	2606	30.04	8.80	0.55	1.09	22.13	38.30	0.11	101.24	1.94	1.01	0.05	0.07	2.01	2.95	0.01	8.07	0.63	0.33	0.01	0.02	0.66	0.34
52	2658	29.88	8.30	0.61	0.89	21.81	38.15	0.00	99.62	1.95	0.97	0.05	0.06	2.01	2.98	0.00	8.02	0.64	0.32	0.02	0.02	0.67	0.33
53	2710	30.49	8.44	0.60	1.13	21.64	38.48	0.01	100.77	1.98	0.97	0.05	0.07	1.98	2.98	0.00	8.03	0.64	0.32	0.02	0.02	0.67	0.33
54	2762	29.89	8.16	0.61	0.94	21.45	38.18	0.00	99.24	1.96	0.96	0.05	0.06	1.98	3.00	0.00	8.01	0.65	0.32	0.02	0.02	0.67	0.33
55	2814	31.16	8.40	0.54	1.10	22.57	38.64	0.00	102.42	1.99	0.96	0.04	0.07	2.03	2.95	0.00	8.04	0.65	0.31	0.01	0.02	0.68	0.32
56	2866	29.71	8.64	0.60	0.97	22.48	38.99	0.12	101.37	1.90	0.98	0.05	0.06	2.03	2.98	0.00	8.00	0.63	0.33	0.02	0.02	0.66	0.34
57	2918	30.57	8.40	0.63	1.00	22.18	38.41	0.07	101.18	1.97	0.97	0.05	0.07	2.02	2.96	0.00	8.03	0.65	0.32	0.02	0.02	0.67	0.33
58	2970	30.89	7.88	0.53	0.93	22.05	38.35	0.75	101.38	1.99	0.90	0.04	0.06	2.00	2.96	0.04	8.00	0.66	0.30	0.01	0.02	0.69	0.31
59	3022	31.78	7.92	0.57	0.95	21.83	37.92	0.06	100.97	2.07	0.92	0.05	0.06	2.00	2.95	0.00	8.05	0.67	0.30	0.02	0.02	0.69	0.31
61	3127	31.02	7.70	0.56	0.97	21.99	37.93	0.09	100.17	2.03	0.90	0.05	0.06	2.03	2.96	0.01	8.02	0.67	0.30	0.02	0.02	0.69	0.31
63	3231	31.25	7.87	0.45	0.89	21.53	37.73	0.00	99.73	2.05	0.92	0.04	0.06	2.00	2.97	0.00	8.04	0.67	0.30	0.01	0.02	0.69	0.31
64	3283	31.57	7.87	0.49	0.95	21.73	37.89	0.00	100.51	2.06	0.92	0.04	0.06	2.00	2.96	0.00	8.04	0.67	0.30	0.01	0.02	0.69	0.31
65	3335	31.26	7.73	0.57	0.98	21.74	37.94	0.00	100.21	2.05	0.90	0.05	0.06	2.00	2.97	0.00	8.03	0.67	0.29	0.02	0.02	0.69	0.31
66	3387	31.24	7.77	0.52	1.11	21.97	37.81	0.00	100.42	2.04	0.90	0.04	0.07	2.02	2.95	0.00	8.04	0.67	0.30	0.01	0.02	0.69	0.31
67	3439	31.53	7.98	0.57	1.01	21.48	38.08	0.00	100.65	2.06	0.93	0.05	0.07	1.97	2.97	0.00	8.04	0.66	0.30	0.02	0.02	0.69	0.31
68	3491	31.62	7.65	0.39	0.82	21.81	37.98	0.00	100.26	2.07	0.89	0.03	0.05	2.01	2.97	0.00	8.03	0.68	0.29	0.01	0.02	0.70	0.30
69	3543	31.16	7.87	0.49	1.09	22.00	37.78	0.01	100.38	2.03	0.92	0.04	0.07	2.02	2.95	0.00	8.04	0.66	0.30	0.01	0.02	0.69	0.31
70	3596	31.46	7.87	0.48	0.87	22.00	38.43	0.07	101.11	2.04	0.91	0.04	0.06	2.01	2.97	0.00	8.02	0.67	0.30	0.01	0.02	0.69	0.31
71	3648	31.77	7.90	0.49	1.01	21.60	37.78	0.00	100.56	2.08	0.92	0.04	0.07	1.99	2.95	0.00	8.05	0.67	0.30	0.01	0.02	0.69	0.31
72	3700	31.91	7.68	0.57	0.87	21.76	37.88	0.00	100.68	2.08	0.89	0.05	0.06	2.00	2.96	0.00	8.04	0.68	0.29	0.02	0.02	0.70	0.30
73	3752	31.73	7.69	0.52	0.91	21.77	37.95	0.00	100.57	2.07	0.89	0.04	0.06	2.00	2.96	0.00	8.04	0.67	0.29	0.01	0.02	0.70	0.30
74	3804	31.70	7.31	0.49	1.00	21.35	37.60	0.00	99.45	2.10	0.86	0.04	0.07	1.99	2.97	0.00	8.03	0.68	0.28	0.01	0.02	0.71	0.29
75	3856	32.07	7.53	0.53	0.99	21.50	38.23	0.02	100.84	2.09	0.87	0.04	0.07	1.98	2.98	0.00	8.03	0.68	0.28	0.01	0.02	0.70	0.30
76	3908	31.91	7.47	0.51	0.95	21.63	38.01	0.00	100.48	2.09	0.87	0.04	0.06	1.99	2.97	0.00	8.03	0.68	0.28	0.01	0.02	0.71	0.29
81	4169	31.43	7.45	0.59	0.86	21.79	37.74	0.00	99.86	2.07	0.87	0.05	0.06	2.02	2.96	0.00	8.03	0.68	0.29	0.02	0.02	0.70	0.30
82	4221	31.35	7.71	0.62	1.25	21.54	37.82	0.00	100.30	2.05	0.90	0.05	0.08	1.99	2.96	0.00	8.04	0.66	0.29	0.02	0.03	0.70	0.30
83	4273	31.70	7.82	0.61	0.85	21.94	37.74	0.00	100.65	2.07	0.91	0.05	0.06	2.02	2.94	0.00	8.05	0.67	0.29	0.02	0.02	0.69	0.31
84	4325	31.50	7.73	0.56	0.77	21.57	38.13	0.10	100.26	2.06	0.90	0.05	0.05	1.99	2.98	0.01	8.03	0.67	0.29	0.02	0.02	0.70	0.30
85	4377	31.48	7.82	0.70	0.81	22.06	37.86	0.00	100.72	2.05	0.91	0.06	0.05	2.02	2.95	0.00	8.04	0.67	0.30	0.02	0.02	0.69	0.31
86	4429	31.34	7.75	0.59	0.82	21.51	37.89	0.04	99.91	2.06	0.91	0.05	0.05	1.99	2.97	0.00	8.03	0.67	0.30	0.02	0.02	0.69	0.31
87	4481	30.62	7.57	0.75	1.03	21.53	38.07	0.16	99.56	2.01	0.89	0.06	0.07	1.99	2.99	0.01	8.01	0.66	0.29	0.02	0.02	0.69	0.31
89	4586	30.73	7.69	0.78	0.95	21.92	38.17	0.00	100.24	2.00	0.89	0.06	0.06	2.01	2.98	0.00	8.02	0.66	0.30	0.02	0.02	0.69	0.31

90	4638	30.92	7.72	0.88	1.01	21.66	37.91	0.00	100.09	2.02	0.90	0.07	0.07	2.00	2.97	0.00	8.03	0.66	0.29	0.02	0.02	0.69	0.31
91	4690	31.04	7.70	0.87	0.85	21.61	38.11	0.00	100.17	2.03	0.90	0.07	0.06	1.99	2.98	0.00	8.03	0.66	0.29	0.02	0.02	0.69	0.31
92	4742	30.91	7.90	0.87	0.89	21.77	37.79	0.00	100.13	2.02	0.92	0.07	0.06	2.01	2.96	0.00	8.04	0.66	0.30	0.02	0.02	0.69	0.31
93	4794	31.22	7.35	0.88	0.93	21.52	37.15	0.01	99.06	2.07	0.87	0.08	0.06	2.01	2.95	0.00	8.04	0.67	0.28	0.02	0.02	0.70	0.30
94	4846	30.97	7.60	0.82	0.97	21.66	37.63	0.02	99.67	2.04	0.89	0.07	0.06	2.01	2.96	0.00	8.03	0.67	0.29	0.02	0.02	0.70	0.30
95	4898	31.43	7.82	0.71	1.04	21.92	38.31	0.03	101.23	2.04	0.90	0.06	0.07	2.00	2.97	0.00	8.03	0.66	0.29	0.02	0.02	0.69	0.31
96	4950	31.62	7.47	0.69	0.98	21.84	38.22	0.00	100.81	2.06	0.87	0.06	0.06	2.00	2.97	0.00	8.02	0.68	0.28	0.02	0.02	0.70	0.30
97	5003	31.50	7.07	0.72	0.96	21.87	38.04	0.08	100.16	2.06	0.83	0.06	0.06	2.02	2.98	0.00	8.01	0.68	0.27	0.02	0.02	0.71	0.29
98	5055	32.11	7.07	0.61	0.98	21.99	38.17	0.00	100.93	2.09	0.82	0.05	0.06	2.02	2.97	0.00	8.02	0.69	0.27	0.02	0.02	0.72	0.28
99	5107	32.68	6.94	0.50	0.98	21.40	37.09	0.02	99.99	2.17	0.82	0.04	0.07	2.00	2.94	0.00	8.09	0.70	0.27	0.01	0.02	0.73	0.27
100	5159	33.09	6.42	0.52	1.01	21.30	37.31	0.05	99.66	2.20	0.76	0.04	0.07	2.00	2.97	0.00	8.04	0.72	0.25	0.01	0.02	0.74	0.26

Table 3.6b: Qualitative trace element analyses of Garnet II from specimen 11E1 along traverse C-D (Plate 5.4). Relative concentrations are measured in counts/second. **D** = distance from starting point C in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1357	2539	1640	1215	2033	48	2449	926	1706	1061	740	1308	96	4950	1313	2548	1527	1138	2065
2	52	1265	2654	1543	1115	2211	49	2501	870	1794	1051	695	1214	99	5107	1162	2611	1574	1129	2083
3	104	1195	2627	1568	1131	2174	50	2553	1195	2418	1481	1010	2245	100	5159	961	1749	1079	714	2274
4	156	1242	2574	1571	1075	2168	51	2606	1193	2502	1534	1036	1979							
5	208	1144	2617	1597	1076	2156	52	2658	1226	2396	1526	977	1946							
6	261	1210	2512	1492	1066	2055	53	2710	1192	2666	1540	1042	1954							
7	313	1233	2498	1503	1079	2146	54	2762	1139	2590	1504	998	1986							
8	365	1220	2546	1504	1062	2082	55	2814	1204	2527	1614	1061	1834							
10	469	1311	2508	1462	1096	2155	56	2866	1139	2533	1596	921	2061							
11	521	1194	2365	1299	981	1597	57	2918	1195	2643	1539	1018	1882							
12	573	1192	2518	1580	1022	2107	58	2970	1437	2665	1565	1044	1920							
13	625	1215	2571	1564	1018	2112	62	3179	1219	2780	1582	1055	1893							
14	677	1211	2530	1508	1069	2131	63	3231	1235	2646	1554	1071	1872							
15	730	1202	2557	1568	1061	2072	64	3283	1209	2569	1516	1025	1960							
16	782	1189	2492	1533	1068	2181	65	3335	1596	2671	1525	1076	1898							
17	834	1192	2527	1513	1044	2054	66	3387	1322	2528	1410	997	1805							
18	886	1225	2560	1623	1051	2070	67	3439	1185	2540	1511	1045	1926							
19	938	1246	2390	1501	1016	1952	68	3491	1239	2524	1510	1068	1978							
20	990	1222	2506	1506	1023	2067	69	3543	1208	2598	1559	1071	1931							
21	1042	1219	2529	1511	1036	2052	70	3596	1239	2712	1560	1017	1969							
22	1094	1199	2547	1574	1037	2008	71	3648	1183	2560	1581	1013	2195							
23	1146	1144	2493	1582	1043	2059	72	3700	1145	2614	1558	1079	1944							
24	1199	1270	2625	1580	1002	2202	73	3752	1170	2680	1565	1047	1909							
25	1251	1193	2496	1388	992	2012	74	3804	1533	2715	1587	1128	1914							
26	1303	1260	2438	1492	1061	2196	75	3856	1320	2802	1520	1104	1874							
27	1355	1188	2531	1529	1026	2234	76	3908	1221	2753	1495	1048	1949							
28	1407	1234	2442	1477	1058	2150	77	3960	1247	2688	1547	1060	1991							
29	1459	1190	2535	1540	1032	2153	78	4012	1220	2580	1253	1072	1711							
30	1511	1206	2537	1496	988	2147	79	4065	1262	2734	1559	1037	2036							
31	1563	1224	2474	1481	967	2176	80	4117	1248	2713	1603	993	1977							
32	1615	1154	2434	1497	1072	1998	81	4169	1236	2843	1544	1028	1914							
33	1668	1240	2516	1470	1043	1989	82	4221	1183	2733	1506	1052	1955							
34	1720	1180	2396	1576	971	1997	83	4273	1248	2856	1538	1072	2022							
35	1772	1091	2353	1270	899	1798	85	4377	1235	2779	1499	1009	1941							
36	1824	1022	1883	1140	818	1692	86	4429	1266	2692	1558	1042	1883							
37	1876	922	1783	1097	765	1836	87	4481	1244	2678	1544	1078	1970							
38	1928	932	1737	1070	775	1761	88	4534	1177	2583	1614	1077	2000							
39	1980	930	1772	1051	708	1711	89	4586	1232	2515	1552	1026	1918							
40	2032	872	1761	1157	736	1675	90	4638	1225	2622	1595	1096	1954							
41	2084	916	1852	1127	743	1693	91	4690	1205	2551	1589	1104	1926							
42	2137	877	1702	1057	719	1262	92	4742	1236	2464	1592	1154	1920							
43	2189	947	1727	1196	768	1876	93	4794	1192	2559	1517	1077	1970							
46	2345	938	1768	1084	760	1685	94	4846	1205	2447	1546	1149	1988							
47	2397	878	1714	1115	721	1276	95	4898	1102	2445	1483	1059	1957							

Table 3.7: Composition of a garnet relict from sample 31A as analyzed along traverse A-B (Plate 5.8). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	30.50	2.56	2.64	6.80	20.60	36.29	0.03	99.50	2.08	0.31	0.23	0.47	1.98	2.96	0.00	8.05	0.67	0.10	0.07	0.15	0.87	0.13
2	75	29.97	3.74	2.66	6.22	21.08	37.63	0.01	101.29	1.99	0.44	0.23	0.42	1.97	2.98	0.00	8.03	0.65	0.14	0.07	0.14	0.82	0.18
3	149	29.97	3.74	2.60	6.36	21.32	37.69	0.00	101.68	1.98	0.44	0.22	0.43	1.98	2.98	0.00	8.03	0.65	0.14	0.07	0.14	0.82	0.18
4	224	30.30	3.56	2.68	5.77	21.10	37.51	0.03	100.91	2.02	0.42	0.23	0.39	1.98	2.99	0.00	8.02	0.66	0.14	0.07	0.13	0.83	0.17
5	298	30.02	3.76	2.66	6.11	21.60	37.56	0.08	101.70	1.98	0.44	0.22	0.41	2.01	2.96	0.00	8.03	0.65	0.14	0.07	0.13	0.82	0.18
6	373	30.37	3.92	2.62	6.01	21.30	37.61	0.11	101.85	2.00	0.46	0.22	0.40	1.98	2.97	0.01	8.04	0.65	0.15	0.07	0.13	0.81	0.19
7	447	29.66	4.17	2.64	5.66	21.34	37.76	0.00	101.24	1.96	0.49	0.22	0.38	1.99	2.98	0.00	8.02	0.64	0.16	0.07	0.12	0.80	0.20
8	522	29.84	4.02	2.46	6.10	21.31	37.92	0.00	101.63	1.97	0.47	0.21	0.41	1.98	2.99	0.00	8.02	0.64	0.15	0.07	0.13	0.81	0.19
9	596	30.47	4.08	2.61	5.81	21.43	37.68	0.00	102.08	2.00	0.48	0.22	0.39	1.99	2.96	0.00	8.04	0.65	0.16	0.07	0.13	0.81	0.19
10	671	30.05	3.94	2.61	6.03	21.53	37.86	0.00	102.02	1.98	0.46	0.22	0.40	1.99	2.98	0.00	8.03	0.65	0.15	0.07	0.13	0.81	0.19

Table 3.8: Composition of a garnet relict from sample 31A as analyzed along traverse C-D (Plate 5.8). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	30.20	3.54	2.60	6.53	21.29	37.50	0.04	101.66	2.00	0.42	0.22	0.44	1.99	2.97	0.00	8.04	0.65	0.14	0.07	0.14	0.83	0.17
2	104	30.12	3.93	2.61	6.23	21.80	38.41	0.04	103.10	1.96	0.45	0.22	0.41	2.00	2.98	0.00	8.02	0.64	0.15	0.07	0.13	0.81	0.19
4	311	30.29	3.93	2.52	6.03	21.68	37.70	0.05	102.15	1.99	0.46	0.21	0.40	2.01	2.96	0.00	8.03	0.65	0.15	0.07	0.13	0.81	0.19
5	415	29.28	1.96	2.83	6.48	23.32	36.25	0.08	100.11	1.96	0.23	0.24	0.44	2.20	2.91	0.00	7.99	0.68	0.08	0.08	0.15	0.89	0.11
6	519	30.12	3.80	2.46	5.91	21.57	37.74	0.00	101.60	1.99	0.45	0.21	0.39	2.01	2.98	0.00	8.02	0.65	0.15	0.07	0.13	0.82	0.18
8	726	29.90	3.97	2.56	5.66	20.72	36.97	0.05	99.79	2.01	0.48	0.22	0.39	1.97	2.98	0.01	8.04	0.65	0.15	0.07	0.12	0.81	0.19
9	830	30.07	4.06	2.65	6.03	21.41	37.71	0.00	101.93	1.98	0.48	0.22	0.40	1.99	2.97	0.00	8.04	0.64	0.15	0.07	0.13	0.81	0.19
10	934	30.58	3.85	2.58	6.38	21.63	37.67	0.00	102.68	2.01	0.45	0.22	0.42	2.00	2.95	0.00	8.05	0.65	0.15	0.07	0.14	0.82	0.18
11	1037	29.72	4.02	2.54	5.98	21.36	37.95	0.00	101.57	1.96	0.47	0.21	0.40	1.98	2.99	0.00	8.02	0.64	0.16	0.07	0.13	0.81	0.19
12	1141	29.78	3.97	2.63	5.86	21.53	37.59	0.04	101.36	1.97	0.47	0.22	0.39	2.01	2.97	0.00	8.03	0.65	0.15	0.07	0.13	0.81	0.19
13	1245	30.35	4.10	2.64	5.93	21.24	37.71	0.00	101.97	2.00	0.48	0.22	0.40	1.97	2.97	0.00	8.04	0.65	0.16	0.07	0.13	0.81	0.19
14	1349	30.28	4.09	2.65	5.84	21.62	38.11	0.13	102.60	1.98	0.48	0.22	0.39	1.99	2.98	0.00	8.03	0.65	0.16	0.07	0.13	0.81	0.19
15	1452	30.27	3.47	2.71	5.85	20.88	36.78	0.05	99.96	2.04	0.42	0.23	0.40	1.98	2.97	0.00	8.04	0.66	0.13	0.08	0.13	0.83	0.17
16	1556	29.79	3.70	2.58	5.71	21.30	37.25	0.00	100.47	1.99	0.44	0.22	0.39	2.00	2.97	0.00	8.03	0.66	0.15	0.07	0.13	0.82	0.18
18	1764	30.11	3.98	2.69	6.00	21.13	37.79	0.00	101.91	1.98	0.47	0.23	0.40	1.96	2.98	0.00	8.03	0.64	0.15	0.07	0.13	0.81	0.19
19	1867	30.52	3.80	2.50	6.33	21.76	37.97	0.09	102.88	1.99	0.44	0.21	0.42	2.00	2.97	0.01	8.03	0.65	0.14	0.07	0.14	0.82	0.18

Table 3.9a: Composition of a garnet from sample 207 as analyzed along traverse A-B (Plate 6.4). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	30.61	5.06	4.79	0.57	21.78	37.91	0.04	100.73	2.01	0.59	0.40	0.04	2.01	2.97	0.00	8.02	0.66	0.19	0.13	0.01	0.77	0.23
2	86	31.37	5.46	4.60	0.40	22.06	38.16	0.00	102.06	2.03	0.63	0.38	0.03	2.01	2.95	0.00	8.04	0.66	0.21	0.12	0.01	0.76	0.24
3	172	31.11	5.09	4.72	0.42	21.53	37.23	0.11	100.10	2.06	0.60	0.40	0.03	2.01	2.95	0.01	8.05	0.67	0.19	0.13	0.01	0.77	0.23
4	258	31.84	5.31	4.48	0.55	22.01	38.10	0.00	102.28	2.06	0.61	0.37	0.04	2.01	2.95	0.00	8.04	0.67	0.20	0.12	0.01	0.77	0.23
5	345	31.25	5.23	4.69	0.61	21.90	37.98	0.02	101.65	2.03	0.61	0.39	0.04	2.01	2.96	0.00	8.04	0.66	0.20	0.13	0.01	0.77	0.23
6	431	31.40	5.08	4.86	0.54	22.06	38.49	0.00	102.43	2.03	0.58	0.40	0.04	2.01	2.97	0.00	8.03	0.66	0.19	0.13	0.01	0.78	0.22
7	517	31.63	5.24	4.97	0.50	21.83	38.21	0.07	102.39	2.05	0.61	0.41	0.03	1.99	2.96	0.00	8.05	0.66	0.20	0.13	0.01	0.77	0.23
8	603	30.70	5.09	4.78	0.52	21.85	38.30	0.00	101.24	2.00	0.59	0.40	0.03	2.01	2.98	0.00	8.01	0.66	0.20	0.13	0.01	0.77	0.23
9	689	31.45	5.11	4.82	0.61	21.90	38.02	0.00	101.90	2.04	0.59	0.40	0.04	2.01	2.96	0.00	8.04	0.66	0.19	0.13	0.01	0.78	0.22
10	775	32.00	5.18	4.57	0.60	21.74	37.73	0.00	101.81	2.09	0.60	0.38	0.04	2.00	2.94	0.00	8.06	0.67	0.19	0.12	0.01	0.78	0.22
13	1034	32.59	5.26	3.76	0.67	22.00	38.09	0.05	102.35	2.11	0.61	0.31	0.04	2.01	2.95	0.00	8.04	0.69	0.20	0.10	0.01	0.78	0.22
14	1120	32.45	5.33	3.59	0.54	22.07	37.67	0.08	101.64	2.12	0.62	0.30	0.04	2.03	2.94	0.00	8.04	0.69	0.20	0.10	0.01	0.77	0.23
15	1206	32.92	5.50	3.29	0.66	21.96	38.01	0.00	102.33	2.14	0.64	0.27	0.04	2.01	2.95	0.00	8.05	0.69	0.21	0.09	0.01	0.77	0.23
16	1292	33.14	5.22	3.07	0.81	21.90	37.73	0.00	101.87	2.16	0.61	0.26	0.05	2.02	2.95	0.00	8.05	0.70	0.20	0.08	0.02	0.78	0.22
17	1378	32.95	5.46	2.87	0.86	22.01	38.06	0.06	102.20	2.14	0.63	0.24	0.06	2.01	2.96	0.00	8.04	0.70	0.21	0.08	0.02	0.77	0.23
18	1465	33.50	5.20	3.00	0.84	21.57	37.70	0.04	101.82	2.19	0.61	0.25	0.06	1.99	2.95	0.00	8.05	0.71	0.20	0.08	0.02	0.78	0.22
22	1809	33.52	5.12	2.99	0.87	21.89	37.79	0.00	102.19	2.19	0.60	0.25	0.06	2.01	2.95	0.00	8.05	0.71	0.19	0.08	0.02	0.79	0.21
24	1981	33.08	5.38	3.04	0.79	21.63	37.75	0.10	101.67	2.16	0.63	0.26	0.05	2.00	2.95	0.01	8.05	0.70	0.20	0.08	0.02	0.78	0.22
28	2326	32.95	5.45	2.91	0.87	21.63	37.76	0.10	101.57	2.16	0.64	0.24	0.06	2.00	2.96	0.01	8.05	0.70	0.21	0.08	0.02	0.77	0.23
29	2412	35.22	4.25	2.91	0.94	21.83	38.04	0.11	103.18	2.29	0.49	0.24	0.06	2.00	2.96	0.01	8.04	0.74	0.16	0.08	0.02	0.82	0.18
31	2585	32.54	5.60	2.99	0.80	21.49	37.91	0.10	101.33	2.13	0.65	0.25	0.05	1.98	2.97	0.01	8.04	0.69	0.21	0.08	0.02	0.77	0.23
33	2757	32.48	5.15	2.93	0.85	21.86	37.90	0.10	101.17	2.13	0.60	0.25	0.06	2.02	2.97	0.01	8.02	0.70	0.20	0.08	0.02	0.78	0.22
34	2843	32.64	5.39	3.09	0.88	21.80	37.64	0.10	101.44	2.14	0.63	0.26	0.06	2.01	2.95	0.01	8.05	0.69	0.20	0.08	0.02	0.77	0.23
36	3015	33.37	5.58	3.00	0.96	22.03	38.72	0.04	103.65	2.14	0.64	0.25	0.06	1.99	2.97	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23
37	3101	33.11	5.37	3.06	0.85	21.95	38.25	0.04	102.59	2.14	0.62	0.25	0.06	2.00	2.96	0.00	8.04	0.70	0.20	0.08	0.02	0.78	0.22
39	3274	32.88	5.48	3.19	0.92	21.85	37.82	0.02	102.13	2.14	0.64	0.27	0.06	2.00	2.94	0.00	8.05	0.69	0.20	0.09	0.02	0.77	0.23
42	3532	33.20	5.44	3.06	0.90	21.69	38.04	0.03	102.32	2.16	0.63	0.26	0.06	1.99	2.96	0.00	8.05	0.70	0.20	0.08	0.02	0.77	0.23
43	3618	33.50	5.46	3.13	0.86	21.63	38.22	0.05	102.80	2.17	0.63	0.26	0.06	1.97	2.96	0.00	8.05	0.70	0.20	0.08	0.02	0.78	0.22

45	3791	32.80	5.42	2.99	0.73	21.64	37.58	0.00	101.16	2.15	0.63	0.25	0.05	2.00	2.95	0.00	8.05	0.70	0.21	0.08	0.02	0.77	0.23
47	3963	32.72	5.61	3.17	0.82	21.67	38.00	0.00	101.99	2.13	0.65	0.26	0.05	1.99	2.96	0.00	8.05	0.69	0.21	0.09	0.02	0.77	0.23
48	4049	33.48	5.00	3.03	0.92	21.93	37.96	0.15	102.31	2.18	0.58	0.25	0.06	2.01	2.95	0.01	8.04	0.71	0.19	0.08	0.02	0.79	0.21
49	4135	33.16	5.69	3.06	0.72	21.97	38.06	0.00	102.65	2.15	0.66	0.25	0.05	2.00	2.95	0.00	8.05	0.69	0.21	0.08	0.02	0.77	0.23
50	4221	32.53	5.34	3.13	1.11	21.97	38.07	0.02	102.16	2.11	0.62	0.26	0.07	2.01	2.96	0.00	8.04	0.69	0.20	0.09	0.02	0.77	0.23
51	4308	32.51	5.42	3.12	0.70	21.74	37.77	0.00	101.56	2.13	0.63	0.26	0.05	2.00	2.95	0.00	8.07	0.69	0.21	0.09	0.02	0.77	0.23
53	4480	32.61	5.57	3.07	0.88	21.50	37.90	0.00	101.52	2.13	0.65	0.26	0.06	1.98	2.96	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23
54	4566	32.30	5.36	3.04	0.92	22.39	38.26	0.01	102.27	2.09	0.62	0.25	0.06	2.04	2.96	0.00	8.02	0.69	0.20	0.08	0.02	0.77	0.23
55	4652	33.09	5.55	3.17	0.86	21.59	37.56	0.00	101.82	2.17	0.65	0.27	0.06	1.99	2.94	0.00	8.07	0.69	0.21	0.08	0.02	0.77	0.23
57	4824	32.91	5.65	3.21	0.77	21.73	37.50	0.15	101.77	2.15	0.66	0.27	0.05	2.00	2.93	0.01	8.07	0.69	0.21	0.09	0.02	0.77	0.23
59	4997	32.37	5.72	3.12	0.81	22.23	38.59	0.02	102.85	2.08	0.66	0.26	0.05	2.01	2.97	0.00	8.03	0.68	0.22	0.08	0.02	0.76	0.24
60	5083	32.81	5.65	2.98	0.96	22.32	38.28	0.05	103.01	2.11	0.65	0.25	0.06	2.02	2.95	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23
61	5169	32.70	5.62	3.12	0.99	22.12	37.64	0.00	102.18	2.13	0.65	0.26	0.07	2.03	2.93	0.00	8.06	0.69	0.21	0.08	0.02	0.77	0.23
62	5255	32.74	5.56	3.06	1.03	21.81	38.08	0.03	102.28	2.13	0.64	0.25	0.07	2.00	2.96	0.00	8.05	0.69	0.21	0.08	0.02	0.77	0.23
63	5341	32.64	5.48	3.01	0.83	21.64	37.93	0.00	101.52	2.13	0.64	0.25	0.05	1.99	2.96	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23
64	5427	32.64	5.37	3.15	0.97	21.94	37.80	0.00	101.87	2.13	0.62	0.26	0.06	2.02	2.95	0.00	8.04	0.69	0.20	0.09	0.02	0.77	0.23
65	5514	32.92	5.45	3.00	1.01	21.67	38.25	0.00	102.30	2.14	0.63	0.25	0.07	1.98	2.97	0.00	8.04	0.69	0.20	0.08	0.02	0.77	0.23
66	5600	33.17	5.04	3.00	0.90	21.56	37.51	0.00	101.18	2.18	0.59	0.25	0.06	2.00	2.95	0.00	8.05	0.71	0.19	0.08	0.02	0.79	0.21
67	5686	32.90	5.20	3.08	0.80	21.75	38.04	0.00	101.76	2.15	0.60	0.26	0.05	2.00	2.97	0.00	8.03	0.70	0.20	0.08	0.02	0.78	0.22
72	6117	33.68	5.05	3.02	1.08	21.82	37.94	0.00	102.60	2.19	0.59	0.25	0.07	2.00	2.95	0.00	8.05	0.71	0.19	0.08	0.02	0.79	0.21
74	6289	32.39	5.37	3.09	0.85	21.58	38.07	0.01	101.35	2.12	0.63	0.26	0.06	1.99	2.98	0.00	8.03	0.69	0.20	0.08	0.02	0.77	0.23
75	6375	32.50	5.46	3.03	0.77	21.31	37.39	0.01	100.46	2.15	0.64	0.26	0.05	1.99	2.96	0.00	8.05	0.69	0.21	0.08	0.02	0.77	0.23
76	6461	33.35	5.64	3.11	0.93	21.90	38.04	0.01	102.97	2.16	0.65	0.26	0.06	2.00	2.94	0.00	8.06	0.69	0.21	0.08	0.02	0.77	0.23
77	6547	32.14	5.38	2.98	0.94	21.69	38.11	0.00	101.24	2.10	0.63	0.25	0.06	2.00	2.98	0.00	8.02	0.69	0.21	0.08	0.02	0.77	0.23
79	6720	32.32	5.27	3.12	0.90	21.81	38.10	0.11	101.51	2.11	0.61	0.26	0.06	2.01	2.97	0.01	8.02	0.69	0.20	0.09	0.02	0.77	0.23
80	6806	32.65	5.39	3.18	0.84	21.31	38.26	0.11	101.62	2.13	0.63	0.27	0.06	1.96	2.99	0.01	8.03	0.69	0.20	0.09	0.02	0.77	0.23
84	7150	33.95	4.16	2.88	1.03	23.35	38.05	0.00	103.53	2.18	0.48	0.24	0.07	2.12	2.93	0.00	8.02	0.74	0.16	0.08	0.02	0.82	0.18
86	7323	33.37	5.46	3.10	0.90	21.90	38.45	0.00	103.18	2.15	0.63	0.26	0.06	1.99	2.96	0.00	8.04	0.70	0.20	0.08	0.02	0.77	0.23
87	7409	32.80	5.38	2.98	0.80	21.48	37.39	0.00	100.83	2.16	0.63	0.25	0.05	2.00	2.95	0.00	8.05	0.70	0.20	0.08	0.02	0.77	0.23
88	7495	32.70	5.09	3.04	0.89	21.75	38.11	0.07	101.58	2.14	0.59	0.25	0.06	2.00	2.98	0.00	8.02	0.70	0.19	0.08	0.02	0.78	0.22
89	7581	33.86	3.59	2.72	0.95	21.64	36.96	0.06	99.83	2.27	0.43	0.23	0.06	2.05	2.96	0.00	8.02	0.76	0.14	0.08	0.02	0.84	0.16
91	7754	32.09	5.51	2.99	0.88	21.69	37.64	0.03	100.79	2.11	0.65	0.25	0.06	2.01	2.96	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23
92	7840	32.88	5.41	3.06	0.83	21.96	38.05	0.00	102.19	2.14	0.63	0.25	0.05	2.01	2.96	0.00	8.04	0.70	0.20	0.08	0.02	0.77	0.23
93	7926	32.06	5.40	3.06	1.00	21.72	37.58	0.07	100.82	2.11	0.63	0.26	0.07	2.01	2.96	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23

95	8098	32.47	5.29	2.97	0.97	21.87	38.06	0.02	101.63	2.12	0.61	0.25	0.06	2.01	2.97	0.00	8.03	0.70	0.20	0.08	0.02	0.78	0.22
96	8184	32.56	5.63	3.11	0.87	21.91	37.86	0.18	102.12	2.12	0.65	0.26	0.06	2.01	2.94	0.01	8.04	0.69	0.21	0.08	0.02	0.76	0.24
97	8270	33.85	4.67	2.97	1.07	22.73	38.83	0.15	104.13	2.16	0.53	0.24	0.07	2.04	2.96	0.01	8.01	0.72	0.18	0.08	0.02	0.80	0.20
98	8357	32.39	5.43	2.94	0.92	21.99	37.80	0.02	101.47	2.12	0.63	0.25	0.06	2.03	2.95	0.00	8.03	0.69	0.21	0.08	0.02	0.77	0.23
99	8443	32.74	5.57	3.03	1.08	21.73	37.87	0.13	102.01	2.13	0.65	0.25	0.07	2.00	2.95	0.01	8.05	0.69	0.21	0.08	0.02	0.77	0.23
103	8787	32.76	5.55	3.12	0.71	21.70	37.42	0.08	101.27	2.15	0.65	0.26	0.05	2.01	2.94	0.00	8.06	0.69	0.21	0.08	0.02	0.77	0.23
104	8873	33.17	5.48	3.02	0.94	21.82	38.37	0.03	102.80	2.14	0.63	0.25	0.06	1.99	2.97	0.00	8.04	0.69	0.20	0.08	0.02	0.77	0.23
105	8960	33.11	5.46	2.99	0.91	21.87	37.84	0.00	102.19	2.16	0.63	0.25	0.06	2.01	2.95	0.00	8.05	0.70	0.20	0.08	0.02	0.77	0.23
106	9046	34.05	4.49	3.15	0.80	21.38	37.33	0.00	101.19	2.25	0.53	0.27	0.05	1.99	2.95	0.00	8.05	0.73	0.17	0.09	0.02	0.81	0.19
107	9132	32.47	5.34	3.07	0.73	21.74	37.73	0.00	101.08	2.13	0.63	0.26	0.05	2.01	2.96	0.00	8.03	0.70	0.20	0.08	0.02	0.77	0.23
108	9218	32.49	5.58	3.06	0.91	21.73	38.11	0.11	101.88	2.12	0.65	0.26	0.06	1.99	2.97	0.01	8.04	0.69	0.21	0.08	0.02	0.77	0.23
110	9390	32.51	5.42	3.00	0.94	22.00	37.82	0.00	101.68	2.12	0.63	0.25	0.06	2.02	2.95	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23
112	9563	31.93	5.40	3.14	0.84	21.48	37.37	0.00	100.16	2.11	0.64	0.27	0.06	2.01	2.96	0.00	8.04	0.69	0.21	0.09	0.02	0.77	0.23
113	9649	32.29	5.66	2.91	0.92	22.42	38.75	0.00	102.95	2.07	0.65	0.24	0.06	2.03	2.97	0.00	8.02	0.69	0.21	0.08	0.02	0.76	0.24
114	9735	32.17	5.30	2.93	0.81	21.91	37.64	0.08	100.76	2.12	0.62	0.25	0.05	2.03	2.96	0.00	8.03	0.70	0.20	0.08	0.02	0.77	0.23
115	9821	32.78	5.57	3.01	0.89	21.90	38.09	0.00	102.24	2.13	0.64	0.25	0.06	2.00	2.96	0.00	8.04	0.69	0.21	0.08	0.02	0.77	0.23
116	9907	32.57	5.33	2.95	0.68	21.62	37.69	0.03	100.83	2.14	0.63	0.25	0.05	2.00	2.97	0.00	8.03	0.70	0.20	0.08	0.01	0.77	0.23
117	9993	32.60	5.70	3.23	0.82	22.15	38.00	0.00	102.50	2.11	0.66	0.27	0.05	2.02	2.94	0.00	8.05	0.68	0.21	0.09	0.02	0.76	0.24
118	10080	32.89	5.44	3.19	0.71	21.67	37.76	0.02	101.66	2.15	0.63	0.27	0.05	2.00	2.95	0.00	8.05	0.69	0.20	0.09	0.02	0.77	0.23
119	10166	33.98	4.92	2.93	0.70	21.81	37.49	0.00	101.83	2.23	0.58	0.25	0.05	2.02	2.94	0.00	8.05	0.72	0.19	0.08	0.01	0.79	0.21
121	10338	32.96	5.43	3.02	0.72	21.95	37.98	0.00	102.06	2.14	0.63	0.25	0.05	2.01	2.95	0.00	8.04	0.70	0.20	0.08	0.02	0.77	0.23
127	10855	32.73	5.36	3.06	0.83	22.08	37.85	0.00	101.91	2.13	0.62	0.26	0.05	2.03	2.95	0.00	8.04	0.70	0.20	0.08	0.02	0.77	0.23
129	11027	32.85	5.55	3.11	0.54	22.07	38.09	0.08	102.21	2.13	0.64	0.26	0.04	2.02	2.95	0.00	8.04	0.69	0.21	0.08	0.01	0.77	0.23
130	11113	32.28	5.51	2.99	0.81	21.74	38.02	0.04	101.34	2.11	0.64	0.25	0.05	2.00	2.97	0.00	8.03	0.69	0.21	0.08	0.02	0.77	0.23
132	11286	34.00	5.03	3.30	0.90	22.11	37.91	0.00	103.24	2.20	0.58	0.27	0.06	2.02	2.93	0.00	8.06	0.71	0.19	0.09	0.02	0.79	0.21
133	11372	32.19	5.21	3.57	0.71	21.76	38.02	0.00	101.47	2.10	0.61	0.30	0.05	2.00	2.97	0.00	8.03	0.69	0.20	0.10	0.02	0.78	0.22
134	11458	32.36	5.22	3.91	0.80	22.16	38.28	0.11	102.74	2.09	0.60	0.32	0.05	2.02	2.96	0.01	8.04	0.68	0.20	0.11	0.02	0.78	0.22
135	11544	32.01	5.31	4.29	0.64	21.84	38.16	0.02	102.25	2.08	0.61	0.36	0.04	2.00	2.96	0.00	8.04	0.67	0.20	0.12	0.01	0.77	0.23
136	11630	31.95	5.19	4.59	0.63	21.60	38.19	0.00	102.14	2.08	0.60	0.38	0.04	1.98	2.97	0.00	8.04	0.67	0.19	0.12	0.01	0.78	0.22
137	11716	31.58	5.10	4.80	0.56	21.90	38.12	0.02	102.07	2.05	0.59	0.40	0.04	2.00	2.96	0.00	8.04	0.67	0.19	0.13	0.01	0.78	0.22
138	11803	31.26	4.91	4.89	0.58	21.49	37.67	0.03	100.80	2.06	0.58	0.41	0.04	1.99	2.96	0.00	8.04	0.67	0.19	0.13	0.01	0.78	0.22
139	11889	31.45	4.86	5.14	0.44	21.92	37.76	0.04	101.58	2.05	0.57	0.43	0.03	2.02	2.95	0.00	8.04	0.67	0.18	0.14	0.01	0.78	0.22
140	11975	31.31	5.07	5.11	0.47	21.68	38.12	0.00	101.76	2.04	0.59	0.43	0.03	1.99	2.97	0.00	8.04	0.66	0.19	0.14	0.01	0.78	0.22
141	12061	30.94	4.82	5.09	0.49	21.64	37.81	0.09	100.79	2.03	0.56	0.43	0.03	2.00	2.97	0.01	8.03	0.66	0.18	0.14	0.01	0.78	0.22

142	12147	31.52	5.19	5.05	0.49	21.98	38.21	0.00	102.44	2.04	0.60	0.42	0.03	2.00	2.95	0.00	8.04	0.66	0.19	0.14	0.01	0.77	0.23
143	12233	31.51	4.89	4.89	0.51	21.85	37.99	0.02	101.64	2.05	0.57	0.41	0.03	2.01	2.96	0.00	8.03	0.67	0.19	0.13	0.01	0.78	0.22
145	12406	31.58	5.15	4.82	0.42	22.13	38.29	0.07	102.39	2.04	0.59	0.40	0.03	2.02	2.96	0.00	8.03	0.67	0.19	0.13	0.01	0.77	0.23
146	12492	31.16	5.43	4.90	0.47	22.12	37.85	0.08	101.93	2.02	0.63	0.41	0.03	2.02	2.94	0.00	8.05	0.65	0.20	0.13	0.01	0.76	0.24
147	12578	31.16	5.28	4.76	0.41	21.70	38.37	0.00	101.69	2.02	0.61	0.40	0.03	1.99	2.98	0.00	8.03	0.66	0.20	0.13	0.01	0.77	0.23
148	12664	31.13	5.37	4.94	0.51	21.96	38.05	0.08	101.95	2.02	0.62	0.41	0.03	2.01	2.95	0.00	8.04	0.65	0.20	0.13	0.01	0.76	0.24
149	12750	31.47	5.45	4.64	0.52	22.96	38.63	0.00	103.67	2.00	0.62	0.38	0.03	2.06	2.94	0.00	8.03	0.66	0.20	0.12	0.01	0.76	0.24

Table 3.9.b: Qualitative trace element analyses of a garnet from sample 207 along traverse A-B (Plate 6.4). Relative concentrations are measured in counts/second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
6	428	1252	2728	1577	1094	2117	67	5658	1136	2497	1662	1111	2173	123	10544	1150	2515	1793	1145	2202
12	943	1272	2859	1576	1091	2360	68	5743	1242	2690	1728	1094	2231	125	10716	1220	2518	1647	1114	2159
13	1028	1241	2684	1520	1100	2379	69	5829	1282	2562	1753	1092	2184	126	10801	1234	2518	1570	1110	2176
14	1114	1231	2634	1598	1064	2268	70	5915	1143	2483	1674	1103	2237	127	10887	1271	2580	1697	1104	2267
15	1200	1303	2592	1589	1118	2353	73	6172	1096	2194	1377	843	1625	128	10973	1261	2436	1577	1068	2205
16	1286	1207	2640	1549	1127	2271	74	6258	1282	2697	1734	1083	2242	129	11059	1246	2419	1619	1005	2326
17	1371	1235	2667	1582	1036	2408	75	6344	1176	2547	1692	1074	2240	130	11144	1279	2457	1670	1055	2385
18	1457	1291	2571	1567	1100	2351	77	6515	1503	2728	1782	1132	2203	131	11230	1272	2584	1657	1100	2407
19	1543	1217	2664	1592	1098	2313	79	6686	1202	2652	1771	1049	2206	132	11316	1307	2496	1698	1037	2413
20	1628	1228	2704	1660	1052	2291	80	6772	1223	2437	1794	1058	2106	133	11402	1299	2551	1608	998	2330
21	1714	1295	2587	1579	1060	2274	81	6858	1218	2603	1735	1051	2294	134	11487	1281	2633	1657	1073	2421
22	1800	1273	2577	1621	1052	2284	82	6944	1175	2355	1686	1014	2294	135	11573	1304	2497	1560	1099	2359
23	1886	1215	2497	1653	1106	2332	83	7029	1212	2709	1702	1077	2136	136	11659	1234	2634	1630	1127	2296
24	1971	1254	2532	1595	1043	2323	84	7115	1203	2483	1718	1123	2210	137	11744	1223	2642	1594	1099	2465
25	2057	1190	2534	1609	1126	2314	85	7201	1305	2538	1765	1155	2166	138	11830	1751	2570	1530	1091	2309
26	2143	1206	2494	1662	1093	2232	86	7287	1230	2617	1766	1140	2269	139	11916	2149	2109	1310	921	1685
27	2229	1260	2478	1564	984	2081	87	7372	1197	2440	1717	1078	2241	140	12002	2641	2589	1594	1105	2308
28	2314	1215	2533	1572	1072	2174	89	7544	1249	2643	1746	1139	2228	141	12087	1410	2637	1548	1118	2348
29	2400	1159	2612	1657	1071	2159	90	7629	1270	2707	1796	1216	2215	142	12173	1279	2650	1477	1105	2288
30	2486	1224	2583	1648	1117	2178	91	7715	1175	2490	1726	1073	2163	143	12259	1949	2640	1575	1167	2311
34	2829	1145	2522	1776	1123	2192	92	7801	1516	2659	1792	1089	2199	145	12430	1165	2569	1565	1099	2266
36	3000	1346	1730	1060	733	1415	93	7887	1178	2596	1744	1132	2239	146	12516	1230	2513	1506	1113	2264
37	3086	1233	2766	1743	1096	2149	94	7972	1197	2521	1651	1025	2261	147	12602	1170	2501	1572	1122	2162
38	3172	1222	2620	1722	1090	2190	95	8058	1208	2422	1739	1059	2217	148	12688	1201	2507	1505	1132	2130
39	3257	1672	2496	1756	1048	2190	97	8230	1260	2394	1718	1029	2130	149	12773	1173	2573	1618	1131	2183
40	3343	1375	2532	1789	1159	2252	98	8315	1157	2463	1737	1071	2249							
42	3514	2005	2541	1787	1019	2177	100	8487	1166	2434	1745	1049	2130							
43	3600	1253	2624	1700	1109	2196	101	8573	1205	2636	1676	1142	2194							
44	3686	1284	2608	1715	1083	2251	102	8744	1192	2560	1672	1028	2195							
46	3857	1215	2467	1744	1058	2233	105	9001	1209	2542	1732	1143	2205							
48	4029	1175	2560	1740	1100	2101	106	9087	1150	2513	1738	1097	2237							
49	4115	1210	2395	1741	1118	2180	107	9173	1319	2471	1668	1005	2353							
50	4200	1221	2595	1749	1146	2181	109	9344	1239	2587	1763	1112	2186							
51	4286	1168	2552	1767	1066	2195	110	9430	1185	2468	1657	1109	2262							
52	4372	1230	2716	1818	1125	2264	111	9516	1266	2599	1741	1047	2184							
53	4458	1283	2620	1725	1159	2152	112	9601	1257	2541	1669	1104	2171							
57	4800	1253	2614	1781	1117	2212	113	9687	1231	2456	1605	1050	2291							
59	4972	1504	2660	1814	1070	2153	114	9773	1260	2484	1747	1060	2205							
60	5058	1234	2534	1675	1128	2176	115	9858	1200	2520	1764	1162	2162							
62	5229	1219	2227	1568	987	2048	116	9944	1150	2565	1680	1163	2205							
63	5315	1261	2608	1755	1043	2171	117	10030	1232	2446	1718	1065	2174							
64	5401	1176	2410	1736	1099	2340	120	10287	1246	2565	1696	1124	2130							
65	5486	1159	2581	1737	1089	2240	121	10373	1210	2548	1773	1018	2165							
66	5572	1195	2430	1696	1095	2153	122	10459	1253	2506	1661	1065	2232							

Table 3.10a: Composition of a garnet from sample 207 as analyzed along traverse C-D (Plate 6.4). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	32.24	4.73	3.81	0.89	21.27	38.37	0.07	101.30	2.11	0.55	0.32	0.06	1.96	3.01	0.00	8.01	0.69	0.18	0.10	0.02	0.79	0.21
6	365	31.23	5.05	4.50	0.59	21.94	39.05	0.00	102.37	2.01	0.58	0.37	0.04	1.99	3.01	0.00	8.00	0.67	0.19	0.12	0.01	0.78	0.22
11	730	31.44	5.21	4.15	0.70	21.73	38.82	0.00	102.07	2.03	0.60	0.34	0.05	1.98	3.00	0.00	8.01	0.67	0.20	0.11	0.02	0.77	0.23
12	803	32.24	5.12	4.20	0.52	21.69	39.11	0.01	102.87	2.07	0.59	0.35	0.03	1.97	3.01	0.00	8.01	0.68	0.19	0.11	0.01	0.78	0.22
13	876	31.68	5.07	4.24	0.59	21.60	38.34	0.00	101.52	2.07	0.59	0.35	0.04	1.98	2.99	0.00	8.02	0.68	0.19	0.12	0.01	0.78	0.22
14	949	31.66	5.23	3.97	0.69	21.09	38.78	0.00	101.43	2.06	0.61	0.33	0.05	1.94	3.02	0.00	8.01	0.68	0.20	0.11	0.01	0.77	0.23
16	1095	32.26	5.16	3.83	0.76	21.62	38.90	0.00	102.55	2.08	0.59	0.32	0.05	1.97	3.00	0.00	8.01	0.68	0.19	0.10	0.02	0.78	0.22
17	1168	32.47	5.26	3.51	0.86	21.81	38.89	0.00	102.79	2.09	0.60	0.29	0.06	1.98	2.99	0.00	8.02	0.69	0.20	0.10	0.02	0.78	0.22
19	1314	32.60	5.61	3.26	0.60	21.93	38.40	0.10	102.41	2.11	0.65	0.27	0.04	2.00	2.97	0.01	8.03	0.69	0.21	0.09	0.01	0.77	0.23
22	1533	32.34	5.39	3.51	0.74	20.89	38.80	0.00	101.67	2.11	0.63	0.29	0.05	1.92	3.02	0.00	8.02	0.69	0.20	0.10	0.02	0.77	0.23
24	1679	31.80	5.51	3.14	1.11	21.28	39.03	0.13	101.85	2.06	0.64	0.26	0.07	1.94	3.03	0.01	8.00	0.68	0.21	0.09	0.02	0.76	0.24
26	1825	33.23	5.60	3.31	0.36	21.82	38.82	0.00	102.79	2.14	0.64	0.27	0.02	1.98	2.99	0.00	8.02	0.69	0.21	0.09	0.01	0.77	0.23
27	1898	32.84	5.22	3.21	0.97	21.64	38.75	0.00	102.61	2.12	0.60	0.27	0.06	1.97	3.00	0.00	8.02	0.70	0.20	0.09	0.02	0.78	0.22
28	1971	32.00	5.53	3.34	0.92	21.76	39.02	0.23	102.56	2.06	0.63	0.28	0.06	1.97	3.00	0.01	8.01	0.68	0.21	0.09	0.02	0.76	0.24
30	2117	32.04	5.53	3.22	1.00	21.87	39.13	0.00	102.79	2.06	0.63	0.26	0.07	1.98	3.00	0.00	8.01	0.68	0.21	0.09	0.02	0.76	0.24
33	2336	32.08	5.25	3.31	0.93	21.28	38.50	0.23	101.35	2.10	0.61	0.28	0.06	1.96	3.01	0.01	8.01	0.69	0.20	0.09	0.02	0.77	0.23
35	2482	31.68	5.18	3.29	0.90	20.85	38.43	0.00	100.34	2.09	0.61	0.28	0.06	1.94	3.03	0.00	8.00	0.69	0.20	0.09	0.02	0.77	0.23
39	2774	31.58	4.89	3.89	0.63	21.53	38.39	0.00	100.92	2.07	0.57	0.33	0.04	1.99	3.01	0.00	8.00	0.69	0.19	0.11	0.01	0.78	0.22
40	2847	31.85	5.22	4.06	0.74	21.59	39.25	0.12	102.70	2.05	0.60	0.33	0.05	1.96	3.02	0.01	8.00	0.68	0.20	0.11	0.02	0.77	0.23
41	2920	31.38	5.25	3.89	1.24	21.06	38.34	0.00	101.17	2.06	0.61	0.33	0.08	1.94	3.00	0.00	8.02	0.67	0.20	0.11	0.03	0.77	0.23
42	2993	31.74	5.34	3.80	1.01	22.06	39.01	0.00	102.96	2.04	0.61	0.31	0.07	1.99	2.99	0.00	8.01	0.67	0.20	0.10	0.02	0.77	0.23
43	3066	31.80	4.77	3.63	0.91	21.27	38.53	0.00	100.91	2.09	0.56	0.31	0.06	1.97	3.02	0.00	8.00	0.69	0.19	0.10	0.02	0.79	0.21
45	3212	32.77	5.46	3.26	1.06	21.04	38.93	0.25	102.53	2.12	0.63	0.27	0.07	1.92	3.01	0.01	8.03	0.69	0.20	0.09	0.02	0.77	0.23
46	3285	33.07	5.15	3.18	0.97	21.32	39.35	0.02	103.04	2.13	0.59	0.26	0.06	1.93	3.03	0.00	8.01	0.70	0.19	0.09	0.02	0.78	0.22
48	3431	32.16	5.41	3.01	1.12	21.95	39.11	0.03	102.76	2.07	0.62	0.25	0.07	1.99	3.01	0.00	8.00	0.69	0.21	0.08	0.02	0.77	0.23
49	3504	32.94	5.23	3.24	1.04	21.09	39.04	0.08	102.58	2.13	0.60	0.27	0.07	1.92	3.02	0.00	8.02	0.69	0.20	0.09	0.02	0.78	0.22
50	3577	32.50	5.20	3.35	0.90	21.43	38.20	0.32	101.90	2.12	0.60	0.28	0.06	1.97	2.98	0.02	8.02	0.69	0.20	0.09	0.02	0.78	0.22
51	3650	32.44	5.13	3.23	0.95	21.05	38.84	0.09	101.64	2.12	0.60	0.27	0.06	1.93	3.03	0.01	8.01	0.69	0.20	0.09	0.02	0.78	0.22

52	3723	32.18	5.52	3.21	1.12	21.93	38.90	0.16	102.86	2.07	0.63	0.26	0.07	1.99	2.99	0.01	8.02	0.68	0.21	0.09	0.02	0.77	0.23
57	4088	32.18	4.92	3.18	0.81	20.75	38.70	0.04	100.53	2.12	0.58	0.27	0.05	1.93	3.05	0.00	7.99	0.70	0.19	0.09	0.02	0.79	0.21
59	4234	31.86	5.44	3.22	1.01	21.10	38.95	0.00	101.58	2.07	0.63	0.27	0.07	1.93	3.03	0.00	8.00	0.68	0.21	0.09	0.02	0.77	0.23
60	4307	33.41	5.14	3.23	0.80	21.63	38.63	0.01	102.85	2.16	0.59	0.27	0.05	1.97	2.99	0.00	8.03	0.70	0.19	0.09	0.02	0.78	0.22
61	4380	33.02	5.36	3.12	0.73	21.32	38.31	0.03	101.86	2.15	0.62	0.26	0.05	1.96	2.99	0.00	8.03	0.70	0.20	0.08	0.02	0.78	0.22
66	4745	32.78	5.19	3.13	1.07	21.69	38.40	0.07	102.27	2.13	0.60	0.26	0.07	1.98	2.98	0.00	8.03	0.70	0.20	0.09	0.02	0.78	0.22
67	4818	32.75	5.05	2.94	1.07	21.10	38.63	0.00	101.55	2.14	0.59	0.25	0.07	1.94	3.02	0.00	8.01	0.70	0.19	0.08	0.02	0.78	0.22
68	4891	32.98	4.86	3.03	0.88	21.70	39.13	0.08	102.59	2.13	0.56	0.25	0.06	1.97	3.02	0.00	7.99	0.71	0.19	0.08	0.02	0.79	0.21
71	5110	32.12	5.26	3.02	0.93	21.31	38.46	0.20	101.10	2.10	0.61	0.25	0.06	1.97	3.01	0.01	8.01	0.69	0.20	0.08	0.02	0.77	0.23
73	5256	32.82	5.32	3.10	0.81	21.49	39.29	0.00	102.82	2.11	0.61	0.26	0.05	1.95	3.02	0.00	8.00	0.70	0.20	0.08	0.02	0.78	0.22
74	5329	33.14	5.52	2.99	0.76	21.46	39.07	0.12	102.94	2.13	0.63	0.25	0.05	1.95	3.01	0.01	8.02	0.70	0.21	0.08	0.02	0.77	0.23
75	5402	31.24	5.15	3.06	1.14	21.53	39.10	0.00	101.20	2.03	0.60	0.25	0.07	1.97	3.04	0.00	7.97	0.69	0.20	0.09	0.03	0.77	0.23
76	5475	32.50	5.21	2.97	0.92	20.90	38.72	0.02	101.20	2.13	0.61	0.25	0.06	1.93	3.03	0.00	8.00	0.70	0.20	0.08	0.02	0.78	0.22
78	5621	32.08	5.40	3.16	1.00	21.22	38.74	0.07	101.59	2.09	0.63	0.26	0.07	1.95	3.02	0.00	8.01	0.69	0.21	0.09	0.02	0.77	0.23
83	5986	31.87	5.35	2.88	1.08	21.69	38.91	0.11	101.78	2.07	0.62	0.24	0.07	1.98	3.02	0.01	7.99	0.69	0.21	0.08	0.02	0.77	0.23
89	6424	32.49	5.03	3.15	1.11	21.38	38.80	0.09	101.97	2.11	0.58	0.26	0.07	1.96	3.02	0.01	8.01	0.70	0.19	0.09	0.02	0.78	0.22
90	6497	32.13	5.32	3.00	1.08	21.05	38.54	0.08	101.13	2.10	0.62	0.25	0.07	1.94	3.02	0.00	8.01	0.69	0.20	0.08	0.02	0.77	0.23
92	6643	32.67	5.20	3.17	1.11	21.51	38.92	0.00	102.59	2.11	0.60	0.26	0.07	1.96	3.01	0.00	8.01	0.69	0.20	0.09	0.02	0.78	0.22
93	6716	32.77	5.47	3.26	0.97	21.43	38.88	0.27	102.79	2.11	0.63	0.27	0.06	1.95	3.00	0.02	8.03	0.69	0.20	0.09	0.02	0.77	0.23
97	7008	32.22	5.68	3.11	0.84	21.63	38.77	0.05	102.23	2.08	0.65	0.26	0.05	1.97	3.00	0.00	8.02	0.68	0.21	0.08	0.02	0.76	0.24
99	7154	32.78	5.48	3.10	0.71	21.24	39.10	0.00	102.41	2.12	0.63	0.26	0.05	1.94	3.02	0.00	8.01	0.69	0.21	0.08	0.02	0.77	0.23
103	7446	31.70	5.04	3.01	1.01	21.28	38.73	0.00	100.77	2.08	0.59	0.25	0.07	1.96	3.03	0.00	7.98	0.70	0.20	0.08	0.02	0.78	0.22
104	7519	32.15	5.41	3.19	1.03	21.41	38.56	0.01	101.75	2.09	0.63	0.27	0.07	1.96	3.00	0.00	8.02	0.69	0.21	0.09	0.02	0.77	0.23
106	7665	31.72	5.14	3.38	0.85	21.41	38.67	0.00	101.17	2.07	0.60	0.28	0.06	1.97	3.02	0.00	8.00	0.69	0.20	0.09	0.02	0.78	0.22
108	7811	32.54	4.91	3.32	1.04	21.50	38.88	0.26	102.19	2.11	0.57	0.28	0.07	1.96	3.02	0.02	8.00	0.70	0.19	0.09	0.02	0.79	0.21
110	7957	32.53	4.59	3.27	1.09	21.54	38.54	0.00	101.56	2.12	0.53	0.27	0.07	1.98	3.01	0.00	8.00	0.71	0.18	0.09	0.02	0.80	0.20
112	8103	31.70	5.04	3.50	1.04	21.57	39.22	0.10	102.07	2.05	0.58	0.29	0.07	1.97	3.03	0.01	7.99	0.69	0.19	0.10	0.02	0.78	0.22
114	8249	32.24	5.03	3.50	0.45	21.40	38.24	0.00	100.85	2.12	0.59	0.29	0.03	1.98	3.00	0.00	8.01	0.70	0.19	0.10	0.01	0.78	0.22
115	8322	32.42	5.08	3.95	0.85	21.33	38.83	0.00	102.46	2.10	0.59	0.33	0.06	1.95	3.01	0.00	8.02	0.68	0.19	0.11	0.02	0.78	0.22
116	8395	32.03	4.92	3.91	0.90	21.32	38.68	0.13	101.76	2.09	0.57	0.33	0.06	1.96	3.01	0.01	8.01	0.69	0.19	0.11	0.02	0.79	0.21
117	8468	31.71	4.67	4.27	0.83	21.54	39.15	0.00	102.17	2.05	0.54	0.35	0.05	1.96	3.03	0.00	7.99	0.68	0.18	0.12	0.02	0.79	0.21
118	8541	31.31	4.86	4.82	0.77	21.13	38.22	0.00	101.11	2.05	0.57	0.41	0.05	1.95	3.00	0.00	8.03	0.67	0.18	0.13	0.02	0.78	0.22
119	8614	31.17	4.79	4.89	0.75	21.67	38.52	0.21	101.79	2.03	0.55	0.41	0.05	1.99	2.99	0.01	8.01	0.67	0.18	0.13	0.02	0.78	0.22
120	8687	30.92	4.59	5.37	0.83	21.86	38.30	0.16	101.87	2.01	0.53	0.45	0.05	2.00	2.98	0.01	8.02	0.66	0.17	0.15	0.02	0.79	0.21

121	8760	30.53	4.92	5.49	0.56	21.22	38.26	0.00	100.99	2.00	0.57	0.46	0.04	1.96	3.00	0.00	8.03	0.65	0.19	0.15	0.01	0.78	0.22
122	8833	29.34	4.66	5.60	0.41	21.72	39.13	0.17	101.33	1.90	0.54	0.46	0.03	1.98	3.03	0.01	8.01	0.65	0.18	0.16	0.01	0.78	0.22
123	8906	30.60	4.81	5.89	0.59	21.58	38.91	0.03	102.36	1.97	0.55	0.49	0.04	1.96	3.00	0.00	8.02	0.65	0.18	0.16	0.01	0.78	0.22
124	8979	30.43	4.66	5.78	0.87	21.50	38.59	0.02	101.82	1.98	0.54	0.48	0.06	1.97	3.00	0.00	8.02	0.65	0.18	0.16	0.02	0.79	0.21
125	9052	30.85	4.66	5.49	0.82	21.59	38.56	0.02	101.98	2.00	0.54	0.46	0.05	1.98	2.99	0.00	8.02	0.66	0.18	0.15	0.02	0.79	0.21
126	9125	31.65	4.86	5.05	0.64	21.65	38.53	0.19	102.37	2.05	0.56	0.42	0.04	1.98	2.98	0.01	8.03	0.67	0.18	0.14	0.01	0.79	0.21
128	9271	31.64	5.14	4.43	0.80	21.85	38.24	0.10	102.10	2.05	0.59	0.37	0.05	2.00	2.97	0.01	8.03	0.67	0.19	0.12	0.02	0.78	0.22
129	9344	31.93	5.23	3.94	0.89	21.45	39.05	0.00	102.49	2.06	0.60	0.33	0.06	1.95	3.01	0.00	8.01	0.68	0.20	0.11	0.02	0.77	0.23
131	9490	31.48	5.10	3.41	0.77	20.82	38.26	0.20	99.84	2.08	0.60	0.29	0.05	1.94	3.03	0.01	8.00	0.69	0.20	0.10	0.02	0.78	0.22
132	9563	32.67	5.35	3.62	0.51	21.65	38.95	0.00	102.73	2.10	0.61	0.30	0.03	1.97	3.00	0.00	8.02	0.69	0.20	0.10	0.01	0.77	0.23
139	10074	31.40	4.93	4.64	0.77	21.40	38.59	0.02	101.73	2.04	0.57	0.39	0.05	1.96	3.00	0.00	8.02	0.67	0.19	0.13	0.02	0.78	0.22
140	10147	30.80	5.20	4.54	0.52	21.47	39.41	0.13	101.95	1.99	0.60	0.38	0.03	1.95	3.04	0.01	7.98	0.66	0.20	0.13	0.01	0.77	0.23
141	10220	31.91	4.88	4.47	0.76	21.88	38.81	0.14	102.71	2.06	0.56	0.37	0.05	1.99	2.99	0.01	8.02	0.68	0.18	0.12	0.02	0.79	0.21
142	10293	31.51	4.83	3.78	0.97	21.42	39.04	0.00	101.55	2.05	0.56	0.31	0.06	1.96	3.03	0.00	7.98	0.69	0.19	0.11	0.02	0.79	0.21
143	10366	31.77	5.12	3.56	0.60	21.09	39.07	0.00	101.22	2.07	0.59	0.30	0.04	1.94	3.05	0.00	7.99	0.69	0.20	0.10	0.01	0.78	0.22
144	10439	31.52	5.07	3.62	0.68	20.97	38.35	0.00	100.21	2.08	0.60	0.31	0.05	1.95	3.02	0.00	8.00	0.69	0.20	0.10	0.01	0.78	0.22
146	10585	32.84	5.23	3.25	0.73	21.65	39.07	0.00	102.77	2.12	0.60	0.27	0.05	1.97	3.01	0.00	8.01	0.70	0.20	0.09	0.02	0.78	0.22
147	10658	32.81	5.15	2.90	0.72	21.92	39.11	0.01	102.60	2.11	0.59	0.24	0.05	1.99	3.01	0.00	7.99	0.71	0.20	0.08	0.02	0.78	0.22
148	10731	32.88	5.01	2.80	0.65	21.30	38.52	0.00	101.16	2.15	0.59	0.24	0.04	1.97	3.02	0.00	8.00	0.71	0.19	0.08	0.01	0.79	0.21
149	10804	32.85	5.31	2.74	1.26	21.96	38.30	0.07	102.42	2.13	0.61	0.23	0.08	2.01	2.97	0.00	8.03	0.70	0.20	0.07	0.03	0.78	0.22
150	10877	33.49	5.16	2.60	0.93	21.47	38.68	0.27	102.33	2.17	0.60	0.22	0.06	1.96	3.00	0.02	8.02	0.71	0.20	0.07	0.02	0.78	0.22

Table 3.10.b: Qualitative trace element analyses of a garnet from sample 207 along traverse C-D (Plate 6.4). Relative concentrations are measured in counts/second. **D** = distance from starting point C in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1137	2310	1512	1133	1759	61	4380	1166	2239	1899	1023	1755	127	9198	1140	2188	1897	995	1804
2	73	1122	2191	1508	1061	1817	62	4453	1214	2194	1835	1054	1776	128	9271	1124	2163	1890	1049	1691
3	146	1194	2218	1536	1045	1816	65	4526	1109	1962	1619	967	1861	129	9344	1161	2137	1796	1052	1769
4	219	1146	2357	1560	1025	1740	66	4745	1093	2188	1814	1035	1867	131	9417	1129	2217	1909	1003	1746
5	292	1875	2383	1498	981	1820	67	4818	1122	2187	1759	978	1840	136	9563	1076	2102	1788	933	1714
6	365	1211	2305	1555	1014	1768	70	4891	1192	2190	1786	964	1657	137	9928	1092	2420	1694	990	1737
7	438	1132	2240	1562	964	1747	71	5110	1267	2220	1809	1019	1847	138	10001	1169	2290	1694	1038	1852
10	511	1201	2149	1478	1016	1675	72	5183	1220	2248	1750	970	1707	139	10074	1140	2156	1659	1054	1761
11	730	1179	2250	1512	994	1811	73	5256	1115	2319	1850	1030	1794	140	10147	1178	2170	1631	1053	1816
12	803	1227	2130	1585	1014	1815	75	5329	1181	2166	1829	1067	1888	141	10220	1124	2143	1648	1000	1804
13	876	1170	2189	1511	1048	1707	76	5475	1755	2382	1756	999	1819	142	10293	1138	2171	1632	976	1931
14	949	1231	2183	1623	938	1808	77	5548	1206	2271	1855	984	1734	143	10366	1140	2097	1577	985	1710
15	1022	1163	2177	1635	984	1780	82	5621	1275	2315	1827	1018	1798	144	10439	1129	2188	1651	1025	1730
16	1095	1145	2243	1644	979	1800	83	5986	1120	2202	1736	1009	1728	145	10512	1123	2245	1667	996	1746
17	1168	1161	2215	1662	1029	1805	85	6059	1160	2277	1795	1061	1766	146	10585	1143	2267	1698	1011	1741
18	1241	1093	2193	1788	980	1765	86	6205	1186	2139	1797	988	1797	147	10658	1169	2288	1632	1008	1795
19	1314	1077	2047	1465	851	1728	87	6278	1059	2103	1781	1025	1796	148	10731	1088	2253	1603	1127	1840
20	1387	1074	2224	1758	1025	1756	88	6351	1194	2213	1850	1024	1787	149	10804	1097	2148	1613	1141	1734
22	1460	1135	2130	1767	1072	1768	89	6424	1582	2245	1795	994	1895	150	10877	929	2056	1515	1036	1824
23	1606	1115	2183	1841	1062	1794	90	6497	1180	2210	1807	967	1790							
24	1679	1075	2098	1827	977	1871	91	6570	1167	2191	1761	1044	1801							
25	1752	1126	2223	1887	1054	1742	93	6643	1212	2237	1777	1012	1803							
26	1825	1154	2221	1685	1078	1790	95	6789	1110	2093	1795	1061	1706							
27	1898	1413	2161	1843	1012	1732	98	6935	1129	2197	1817	1024	1693							
29	1971	1086	2198	1829	1021	1754	102	7154	1126	2200	1727	1086	1782							
30	2117	1119	2112	1844	1097	1773	103	7446	1153	2225	1837	1030	1779							
31	2190	1181	2127	1735	1019	1742	104	7519	1222	2171	1807	1034	1744							
33	2263	1126	2063	1823	993	1751	106	7592	1164	2066	1699	962	1887							
35	2409	1108	2131	1806	1019	1751	108	7738	1436	2279	1811	1037	1732							
36	2555	1100	2169	1762	1028	1700	109	7884	1127	2327	1741	1066	1744							
37	2628	1142	2268	1842	1024	1761	113	7957	1545	2281	1887	1017	1720							
39	2701	1590	2216	1707	1070	1811	114	8249	1087	2201	1842	1021	1677							
40	2847	1141	2202	1861	1044	1781	115	8322	1107	2215	1763	1038	1778							
41	2920	1142	2160	1793	1039	1794	116	8395	1204	2105	1758	971	1849							
44	2993	1197	2195	1807	1041	1785	117	8468	1199	2186	1925	1059	1712							
45	3212	1264	2188	1752	1035	1715	118	8541	1159	2160	1962	1032	1726							
48	3285	1071	2249	1837	1056	1691	119	8614	1324	2217	1923	1039	1763							
50	3504	1180	2293	1790	1058	1780	120	8687	1146	2243	1947	1047	1778							
52	3650	1337	2241	1868	1001	1752	121	8760	1220	2180	1943	1034	1763							
53	3796	1228	2146	1886	959	1785	122	8833	1185	2190	2002	1017	1754							
55	3869	1217	2271	1830	978	1802	123	8906	1186	2067	2004	1025	1735							
57	4015	1069	2102	1703	950	1738	124	8979	1149	2161	1989	1022	1821							
59	4161	1163	2288	1829	1050	1749	125	9052	986	1933	1677	966	1677							
60	4307	1270	2247	1707	1018	1863	126	9125	1099	2232	1938	972	1830							

Table 3.11a: Composition of a garnet from sample 208 as analyzed along traverse A-B (Plate 6.17). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	29.87	4.07	4.33	3.69	20.93	36.65	0.00	99.54	2.01	0.49	0.37	0.25	1.99	2.95	0.00	8.06	0.64	0.16	0.12	0.08	0.80	0.20
2	51	30.09	4.57	3.97	2.99	21.05	36.86	0.03	99.54	2.02	0.55	0.34	0.20	1.99	2.95	0.00	8.05	0.65	0.18	0.11	0.07	0.79	0.21
3	103	29.92	4.81	4.16	2.24	21.28	37.23	0.05	99.64	1.99	0.57	0.36	0.15	2.00	2.97	0.00	8.04	0.65	0.19	0.12	0.05	0.78	0.22
4	154	29.99	5.09	4.00	2.15	21.52	37.07	0.00	99.81	1.99	0.60	0.34	0.14	2.02	2.95	0.00	8.04	0.65	0.20	0.11	0.05	0.77	0.23
5	205	30.00	5.12	4.01	2.27	21.50	37.34	0.05	100.25	1.99	0.60	0.34	0.15	2.01	2.95	0.00	8.04	0.64	0.20	0.11	0.05	0.77	0.23
6	257	29.72	5.21	4.16	2.10	21.26	37.38	0.01	99.83	1.97	0.62	0.35	0.14	1.99	2.97	0.00	8.04	0.64	0.20	0.11	0.05	0.76	0.24
7	308	29.84	5.48	4.20	2.13	21.47	37.32	0.00	100.43	1.97	0.64	0.36	0.14	2.00	2.95	0.00	8.06	0.63	0.21	0.11	0.05	0.75	0.25
8	359	29.58	5.26	4.15	1.99	21.19	36.93	0.00	99.09	1.98	0.63	0.36	0.13	2.00	2.95	0.00	8.05	0.64	0.20	0.11	0.04	0.76	0.24
9	410	30.17	5.53	4.09	2.06	21.74	37.46	0.00	101.05	1.98	0.65	0.34	0.14	2.01	2.94	0.00	8.06	0.64	0.21	0.11	0.04	0.75	0.25
10	462	29.76	5.61	4.11	1.94	21.60	37.40	0.00	100.43	1.96	0.66	0.35	0.13	2.01	2.95	0.00	8.05	0.63	0.21	0.11	0.04	0.75	0.25
11	513	29.88	5.84	4.03	1.90	21.91	38.01	0.00	101.58	1.94	0.68	0.34	0.13	2.01	2.95	0.00	8.04	0.63	0.22	0.11	0.04	0.74	0.26
13	616	29.35	5.67	4.02	1.75	21.40	36.74	0.16	98.93	1.96	0.68	0.34	0.12	2.02	2.94	0.01	8.05	0.63	0.22	0.11	0.04	0.74	0.26
14	667	30.77	4.61	4.02	2.46	21.50	37.22	0.00	100.57	2.04	0.54	0.34	0.16	2.01	2.95	0.00	8.05	0.66	0.18	0.11	0.05	0.79	0.21
16	770	30.96	4.86	3.86	1.97	21.34	37.30	0.06	100.27	2.05	0.57	0.33	0.13	2.00	2.96	0.00	8.04	0.66	0.19	0.11	0.04	0.78	0.22
17	821	30.02	5.42	4.18	1.85	21.27	37.11	0.00	99.85	1.99	0.64	0.36	0.12	1.99	2.95	0.00	8.06	0.64	0.21	0.11	0.04	0.76	0.24
18	872	29.33	5.85	4.10	1.83	21.78	37.41	0.00	100.29	1.93	0.69	0.35	0.12	2.02	2.94	0.00	8.05	0.63	0.22	0.11	0.04	0.74	0.26
19	924	29.52	6.22	4.17	1.63	21.38	37.51	0.07	100.71	1.94	0.73	0.35	0.11	1.98	2.94	0.00	8.09	0.62	0.23	0.11	0.03	0.73	0.27
20	975	28.89	6.18	4.26	1.69	21.53	37.21	0.04	99.75	1.91	0.73	0.36	0.11	2.01	2.94	0.00	8.06	0.61	0.23	0.12	0.04	0.72	0.28
21	1026	28.75	6.12	4.30	1.69	21.64	37.54	0.00	100.05	1.89	0.72	0.36	0.11	2.01	2.95	0.00	8.04	0.61	0.23	0.12	0.04	0.72	0.28
22	1078	29.36	6.15	4.40	1.59	21.81	37.86	0.00	101.17	1.91	0.71	0.37	0.11	2.00	2.95	0.00	8.05	0.62	0.23	0.12	0.03	0.73	0.27
23	1129	29.14	6.54	4.26	1.48	22.11	37.84	0.00	101.37	1.89	0.76	0.35	0.10	2.02	2.94	0.00	8.05	0.61	0.24	0.11	0.03	0.71	0.29
24	1180	29.03	6.09	4.04	1.65	21.67	37.23	0.00	99.72	1.92	0.72	0.34	0.11	2.02	2.94	0.00	8.05	0.62	0.23	0.11	0.04	0.73	0.27
25	1231	28.93	6.11	3.94	1.81	21.61	37.59	0.00	100.00	1.90	0.72	0.33	0.12	2.01	2.96	0.00	8.04	0.62	0.23	0.11	0.04	0.73	0.27
29	1437	29.00	5.81	4.01	1.57	21.58	37.37	0.00	99.33	1.92	0.69	0.34	0.11	2.02	2.96	0.00	8.03	0.63	0.22	0.11	0.03	0.74	0.26
30	1488	29.01	6.09	4.27	1.59	21.73	37.32	0.05	100.00	1.91	0.72	0.36	0.11	2.02	2.94	0.00	8.05	0.62	0.23	0.12	0.03	0.73	0.27
31	1539	28.48	5.91	4.36	1.78	21.56	37.43	0.01	99.52	1.88	0.70	0.37	0.12	2.01	2.96	0.00	8.04	0.61	0.23	0.12	0.04	0.73	0.27
32	1591	28.34	6.04	4.57	1.66	21.43	37.62	0.05	99.66	1.87	0.71	0.39	0.11	1.99	2.97	0.00	8.04	0.61	0.23	0.13	0.04	0.72	0.28
33	1642	28.79	6.16	4.49	1.67	21.71	37.54	0.00	100.36	1.89	0.72	0.38	0.11	2.01	2.95	0.00	8.05	0.61	0.23	0.12	0.04	0.72	0.28

35	1745	28.59	6.27	4.81	1.59	21.43	37.52	0.00	100.21	1.88	0.73	0.41	0.11	1.99	2.95	0.00	8.06	0.60	0.24	0.13	0.03	0.72	0.28
36	1796	28.26	6.35	4.81	1.50	21.54	37.56	0.01	100.02	1.86	0.74	0.41	0.10	1.99	2.95	0.00	8.05	0.60	0.24	0.13	0.03	0.71	0.29
37	1847	28.48	6.26	4.75	1.57	21.64	37.59	0.00	100.27	1.87	0.73	0.40	0.10	2.00	2.95	0.00	8.05	0.60	0.24	0.13	0.03	0.72	0.28
38	1898	28.44	6.26	4.75	1.72	21.90	37.89	0.03	100.96	1.85	0.73	0.40	0.11	2.01	2.95	0.00	8.05	0.60	0.24	0.13	0.04	0.72	0.28
39	1950	28.14	6.22	4.69	1.62	21.75	37.64	0.06	100.05	1.85	0.73	0.39	0.11	2.01	2.95	0.00	8.04	0.60	0.24	0.13	0.03	0.72	0.28
40	2001	28.37	6.16	4.84	1.73	21.70	37.70	0.00	100.50	1.86	0.72	0.41	0.11	2.00	2.95	0.00	8.05	0.60	0.23	0.13	0.04	0.72	0.28
41	2052	28.33	6.34	4.80	1.69	21.60	37.66	0.00	100.42	1.86	0.74	0.40	0.11	1.99	2.95	0.00	8.05	0.60	0.24	0.13	0.04	0.71	0.29
42	2104	28.06	6.46	4.74	1.67	21.63	37.46	0.02	100.02	1.84	0.76	0.40	0.11	2.00	2.94	0.00	8.06	0.59	0.24	0.13	0.04	0.71	0.29
43	2155	28.54	6.23	4.85	1.69	21.87	38.14	0.10	101.32	1.85	0.72	0.40	0.11	2.00	2.96	0.01	8.04	0.60	0.23	0.13	0.04	0.72	0.28
44	2206	27.54	6.04	4.65	1.77	21.47	36.92	0.03	98.70	1.84	0.72	0.40	0.12	2.02	2.94	0.00	8.06	0.60	0.23	0.13	0.04	0.72	0.28
46	2309	29.64	5.80	4.59	1.66	21.27	36.02	0.11	98.98	1.99	0.69	0.40	0.11	2.01	2.89	0.01	8.10	0.59	0.24	0.14	0.03	0.71	0.29
49	2463	28.35	6.17	5.36	1.51	21.44	37.78	0.00	100.62	1.85	0.72	0.45	0.10	1.98	2.96	0.00	8.06	0.59	0.23	0.14	0.03	0.72	0.28
50	2514	27.67	5.99	5.24	1.53	21.26	37.22	0.00	98.90	1.84	0.71	0.45	0.10	1.99	2.96	0.00	8.05	0.59	0.22	0.15	0.04	0.72	0.28
51	2566	27.73	5.91	5.37	1.66	21.49	37.85	0.11	100.00	1.82	0.69	0.45	0.11	1.99	2.97	0.01	8.03	0.59	0.23	0.14	0.04	0.72	0.28
52	2617	28.01	6.23	5.31	1.68	21.40	37.54	0.00	100.17	1.84	0.73	0.45	0.11	1.98	2.95	0.00	8.06	0.59	0.23	0.15	0.04	0.72	0.28
53	2668	27.98	6.19	5.43	1.67	21.80	37.99	0.00	101.07	1.82	0.72	0.45	0.11	2.00	2.95	0.00	8.05	0.59	0.23	0.14	0.03	0.72	0.28
54	2719	27.52	6.03	5.15	1.51	21.18	37.20	0.15	98.59	1.83	0.72	0.44	0.10	1.99	2.96	0.01	8.04	0.59	0.23	0.15	0.03	0.72	0.28
55	2771	27.78	6.04	5.32	1.47	21.58	37.47	0.00	99.65	1.83	0.71	0.45	0.10	2.00	2.95	0.00	8.04	0.59	0.23	0.14	0.04	0.72	0.28
56	2822	28.41	6.17	5.38	1.69	21.90	38.11	0.00	101.65	1.84	0.71	0.45	0.11	2.00	2.95	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
57	2873	27.72	6.15	5.53	1.60	21.73	37.56	0.02	100.28	1.82	0.72	0.46	0.11	2.01	2.94	0.00	8.05	0.60	0.22	0.15	0.03	0.73	0.27
58	2925	28.40	5.83	5.44	1.51	21.28	37.73	0.00	100.19	1.87	0.68	0.46	0.10	1.97	2.97	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
59	2976	27.85	6.02	5.34	1.51	21.95	38.11	0.02	100.78	1.81	0.70	0.45	0.10	2.01	2.96	0.00	8.03	0.60	0.23	0.14	0.03	0.72	0.28
60	3027	27.99	6.06	5.29	1.43	21.75	37.39	0.07	99.90	1.84	0.71	0.45	0.10	2.02	2.94	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
61	3079	27.90	6.05	5.45	1.55	21.46	37.65	0.08	100.06	1.83	0.71	0.46	0.10	1.99	2.96	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
62	3130	28.16	6.04	5.58	1.42	21.45	37.61	0.06	100.25	1.85	0.71	0.47	0.09	1.98	2.95	0.00	8.06	0.59	0.23	0.15	0.03	0.72	0.28
63	3181	27.91	6.07	5.38	1.58	21.43	37.65	0.00	100.03	1.83	0.71	0.45	0.11	1.99	2.96	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
64	3233	27.97	6.09	5.43	1.54	21.37	37.47	0.01	99.86	1.84	0.72	0.46	0.10	1.98	2.95	0.00	8.06	0.59	0.23	0.15	0.03	0.71	0.29
65	3284	27.71	6.21	5.48	1.54	21.53	37.80	0.00	100.56	1.81	0.72	0.46	0.10	1.98	2.95	0.00	8.08	0.59	0.23	0.15	0.03	0.72	0.28
66	3335	27.86	6.10	5.49	1.58	21.23	37.54	0.00	99.80	1.84	0.72	0.46	0.11	1.97	2.96	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
67	3386	28.19	6.12	5.49	1.60	21.65	37.52	0.09	100.58	1.85	0.71	0.46	0.11	2.00	2.94	0.01	8.06	0.60	0.23	0.15	0.03	0.73	0.27
68	3438	28.02	5.95	5.38	1.49	22.00	37.47	0.10	100.31	1.84	0.70	0.45	0.10	2.03	2.94	0.01	8.05	0.59	0.23	0.15	0.03	0.72	0.28
69	3489	27.48	5.92	5.45	1.57	21.53	37.22	0.05	99.17	1.82	0.70	0.46	0.11	2.01	2.95	0.00	8.05	0.60	0.22	0.14	0.03	0.73	0.27
72	3643	28.09	5.93	5.24	1.61	21.21	37.56	0.05	99.64	1.86	0.70	0.44	0.11	1.97	2.97	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
73	3694	28.31	6.24	5.52	1.45	21.74	37.91	0.07	101.17	1.84	0.72	0.46	0.10	1.99	2.95	0.00	8.06	0.59	0.23	0.14	0.03	0.72	0.28

79	4002	28.22	6.13	5.22	1.19	21.54	37.82	0.05	100.12	1.85	0.72	0.44	0.08	1.99	2.97	0.00	8.04	0.59	0.23	0.15	0.03	0.72	0.28
80	4053	28.47	6.10	5.54	1.49	21.74	38.01	0.09	101.34	1.85	0.71	0.46	0.10	1.99	2.95	0.01	8.05	0.59	0.23	0.14	0.03	0.72	0.28
81	4105	28.25	6.25	5.25	1.42	21.94	37.57	0.00	100.69	1.84	0.73	0.44	0.09	2.02	2.93	0.00	8.06	0.59	0.24	0.14	0.03	0.71	0.29
82	4156	28.14	6.31	5.28	1.37	21.46	37.54	0.00	100.10	1.85	0.74	0.44	0.09	1.99	2.95	0.00	8.06	0.60	0.23	0.15	0.03	0.72	0.28
83	4207	28.35	6.11	5.37	1.18	21.54	37.22	0.10	99.77	1.87	0.72	0.45	0.08	2.00	2.94	0.01	8.06	0.60	0.23	0.14	0.03	0.72	0.28
84	4259	28.14	6.11	5.34	1.40	21.41	37.90	0.10	100.30	1.84	0.71	0.45	0.09	1.98	2.97	0.01	8.04	0.60	0.23	0.14	0.03	0.73	0.27
85	4310	28.44	6.03	5.36	1.42	21.56	37.82	0.02	100.63	1.86	0.70	0.45	0.09	1.99	2.96	0.00	8.05	0.60	0.23	0.14	0.03	0.73	0.27
86	4361	28.23	5.95	5.19	1.38	21.68	37.93	0.09	100.36	1.85	0.69	0.44	0.09	2.00	2.97	0.01	8.03	0.60	0.22	0.15	0.03	0.73	0.27
87	4413	27.66	5.77	5.23	1.27	22.04	37.45	0.00	99.83	1.82	0.68	0.44	0.08	2.04	2.95	0.00	8.05	0.59	0.24	0.14	0.03	0.71	0.29
88	4464	27.92	6.40	5.35	1.38	21.75	37.79	0.00	100.59	1.82	0.74	0.45	0.09	2.00	2.95	0.00	8.05	0.60	0.23	0.15	0.03	0.73	0.27
89	4515	28.32	6.01	5.38	1.49	21.60	37.82	0.00	100.62	1.85	0.70	0.45	0.10	1.99	2.96	0.00	8.05	0.59	0.24	0.14	0.03	0.71	0.29
90	4567	27.76	6.44	5.11	1.39	21.83	37.41	0.00	99.94	1.82	0.75	0.43	0.09	2.02	2.94	0.00	8.05	0.60	0.23	0.14	0.03	0.73	0.27
94	4772	28.48	6.24	5.23	1.37	21.82	37.44	0.03	100.85	1.86	0.73	0.44	0.09	2.01	2.93	0.00	8.09	0.60	0.23	0.14	0.03	0.72	0.28
95	4823	28.45	6.21	5.38	1.33	21.72	37.52	0.06	100.61	1.86	0.72	0.45	0.09	2.00	2.94	0.00	8.06	0.60	0.24	0.14	0.03	0.72	0.28
96	4874	27.98	6.24	5.08	1.26	22.41	37.69	0.00	100.67	1.82	0.72	0.42	0.08	2.06	2.93	0.00	8.04	0.59	0.23	0.15	0.03	0.72	0.28
97	4926	28.19	6.14	5.46	1.38	21.89	37.90	0.00	100.96	1.83	0.71	0.46	0.09	2.01	2.95	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
98	4977	28.03	6.19	5.38	1.23	21.48	37.55	0.02	99.86	1.84	0.73	0.45	0.08	1.99	2.95	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
99	5028	27.83	5.96	5.28	1.40	21.91	37.53	0.00	99.90	1.83	0.70	0.44	0.09	2.03	2.95	0.00	8.04	0.59	0.23	0.15	0.03	0.72	0.28
103	5234	28.11	6.23	5.24	1.44	22.07	37.63	0.06	100.71	1.83	0.72	0.44	0.10	2.03	2.93	0.00	8.05	0.60	0.23	0.14	0.02	0.72	0.28
104	5285	28.08	6.08	5.13	1.12	21.84	37.27	0.00	99.52	1.85	0.71	0.43	0.07	2.03	2.94	0.00	8.05	0.60	0.23	0.15	0.03	0.73	0.27
105	5336	27.98	5.90	5.29	1.38	21.57	37.77	0.02	99.89	1.84	0.69	0.45	0.09	2.00	2.97	0.00	8.03	0.61	0.22	0.14	0.03	0.73	0.27
108	5490	28.44	5.91	5.42	1.38	21.41	37.67	0.00	100.22	1.87	0.69	0.46	0.09	1.98	2.96	0.00	8.05	0.60	0.24	0.14	0.03	0.72	0.28
109	5541	27.77	6.16	5.23	1.20	21.82	37.39	0.04	99.57	1.83	0.72	0.44	0.08	2.03	2.94	0.00	8.04	0.60	0.23	0.15	0.03	0.72	0.28
112	5695	28.45	6.31	5.31	1.16	21.34	37.55	0.07	100.12	1.87	0.74	0.45	0.08	1.98	2.95	0.00	8.06	0.59	0.23	0.15	0.03	0.72	0.28
113	5747	28.04	6.06	5.36	1.44	21.61	37.50	0.05	100.01	1.84	0.71	0.45	0.10	2.00	2.95	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
114	5798	28.32	6.07	5.29	1.29	21.85	37.69	0.04	100.51	1.85	0.71	0.44	0.09	2.01	2.95	0.00	8.05	0.60	0.23	0.15	0.03	0.72	0.28
115	5849	28.31	6.10	5.37	1.36	21.36	37.65	0.01	100.17	1.86	0.71	0.45	0.09	1.98	2.96	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
116	5901	28.24	6.07	5.25	1.37	21.51	37.64	0.00	100.08	1.86	0.71	0.44	0.09	1.99	2.96	0.00	8.05	0.60	0.23	0.14	0.03	0.73	0.27
117	5952	28.34	6.02	5.06	1.41	21.67	37.51	0.07	100.02	1.86	0.71	0.43	0.09	2.01	2.95	0.00	8.05	0.59	0.23	0.14	0.03	0.72	0.28
120	6106	28.57	6.22	5.29	1.40	21.87	37.84	0.04	101.18	1.86	0.72	0.44	0.09	2.00	2.94	0.00	8.06	0.60	0.23	0.14	0.03	0.72	0.28
121	6157	28.11	6.18	5.18	1.42	21.55	37.70	0.03	100.14	1.84	0.72	0.44	0.09	1.99	2.96	0.00	8.05	0.60	0.24	0.14	0.03	0.72	0.28
122	6209	28.05	6.21	5.18	1.27	21.84	37.83	0.00	100.39	1.83	0.72	0.43	0.08	2.01	2.95	0.00	8.04	0.59	0.24	0.14	0.02	0.71	0.29
123	6260	28.30	6.42	5.25	1.17	21.66	37.41	0.14	100.22	1.86	0.75	0.44	0.08	2.00	2.93	0.01	8.06	0.60	0.23	0.14	0.03	0.72	0.28
124	6311	28.01	6.15	5.14	1.34	21.54	37.60	0.17	99.78	1.84	0.72	0.43	0.09	2.00	2.96	0.01	8.04	0.60	0.23	0.14	0.03	0.72	0.28

125	6362	27.96	6.03	5.09	1.47	21.42	37.28	0.09	99.26	1.85	0.71	0.43	0.10	2.00	2.95	0.01	8.05	0.60	0.23	0.13	0.03	0.72	0.28
126	6414	28.43	6.19	4.96	1.52	21.44	37.55	0.02	100.08	1.87	0.73	0.42	0.10	1.99	2.95	0.00	8.05	0.60	0.24	0.14	0.03	0.72	0.28
127	6465	28.21	6.26	5.12	1.38	21.95	37.94	0.10	100.85	1.84	0.73	0.43	0.09	2.01	2.95	0.01	8.04	0.60	0.23	0.14	0.03	0.72	0.28
130	6619	27.95	6.48	5.18	1.29	22.05	37.81	0.09	100.74	1.82	0.75	0.43	0.08	2.02	2.94	0.01	8.05	0.60	0.24	0.14	0.03	0.71	0.29
131	6670	27.22	6.09	4.89	1.27	21.55	37.30	0.00	98.31	1.81	0.72	0.42	0.09	2.02	2.97	0.00	8.02	0.60	0.24	0.14	0.03	0.72	0.28
132	6722	27.91	6.23	5.08	1.20	21.84	37.90	0.01	100.16	1.83	0.73	0.43	0.08	2.01	2.96	0.00	8.03	0.59	0.23	0.14	0.03	0.72	0.28
133	6773	28.60	6.35	5.20	1.55	21.58	37.98	0.13	101.25	1.86	0.74	0.43	0.10	1.98	2.95	0.01	8.06	0.60	0.23	0.14	0.03	0.72	0.28
134	6824	28.19	6.02	5.03	1.48	21.53	37.82	0.00	100.06	1.85	0.70	0.42	0.10	1.99	2.97	0.00	8.04	0.61	0.24	0.13	0.03	0.72	0.28
135	6876	28.36	6.20	4.75	1.27	21.39	37.66	0.00	99.63	1.87	0.73	0.40	0.08	1.99	2.97	0.00	8.04	0.60	0.24	0.13	0.03	0.71	0.29
136	6927	28.27	6.36	4.84	1.47	21.74	38.12	0.00	100.79	1.84	0.74	0.40	0.10	1.99	2.97	0.00	8.04	0.61	0.23	0.13	0.03	0.73	0.27
137	6978	28.59	6.08	4.75	1.46	21.81	37.65	0.00	100.35	1.87	0.71	0.40	0.10	2.01	2.95	0.00	8.04	0.61	0.23	0.13	0.03	0.73	0.27
138	7029	28.20	5.90	4.82	1.53	21.95	37.91	0.02	100.30	1.84	0.69	0.40	0.10	2.02	2.96	0.00	8.02	0.61	0.23	0.13	0.03	0.73	0.27
139	7081	28.68	6.00	4.64	1.52	21.69	37.83	0.03	100.35	1.88	0.70	0.39	0.10	2.00	2.96	0.00	8.04	0.60	0.23	0.13	0.04	0.72	0.28
140	7132	28.54	6.20	4.73	1.67	21.93	37.51	0.00	100.58	1.87	0.72	0.40	0.11	2.02	2.93	0.00	8.05	0.61	0.23	0.13	0.04	0.73	0.27
141	7183	28.85	6.01	4.61	1.68	21.80	38.03	0.09	100.98	1.88	0.70	0.38	0.11	2.00	2.96	0.01	8.04	0.61	0.22	0.13	0.03	0.73	0.27
142	7235	28.45	5.81	4.74	1.53	21.36	37.23	0.06	99.12	1.89	0.69	0.40	0.10	2.00	2.96	0.00	8.04	0.62	0.22	0.13	0.03	0.74	0.26
143	7286	29.37	5.80	4.70	1.55	21.72	37.12	0.00	100.26	1.94	0.68	0.40	0.10	2.02	2.93	0.00	8.06	0.62	0.22	0.13	0.04	0.74	0.26
144	7337	28.93	5.75	4.62	1.68	21.99	37.68	0.07	100.64	1.89	0.67	0.39	0.11	2.03	2.95	0.00	8.04	0.63	0.19	0.14	0.04	0.77	0.23
145	7389	30.10	5.08	5.11	1.71	21.75	37.47	0.10	101.22	1.97	0.59	0.43	0.11	2.01	2.94	0.01	8.06	0.63	0.20	0.13	0.04	0.76	0.24
146	7440	29.87	5.30	4.92	1.72	21.38	37.31	0.08	100.50	1.97	0.62	0.42	0.11	1.99	2.95	0.00	8.06	0.62	0.21	0.13	0.04	0.75	0.25
147	7491	29.16	5.49	4.69	1.80	21.82	36.89	0.00	99.84	1.93	0.65	0.40	0.12	2.04	2.92	0.00	8.06	0.62	0.21	0.12	0.04	0.75	0.25
148	7543	29.46	5.56	4.58	1.90	22.12	37.62	0.01	101.25	1.92	0.65	0.38	0.13	2.03	2.94	0.00	8.05	0.64	0.20	0.12	0.05	0.76	0.24
149	7594	29.82	5.23	4.30	2.14	21.73	37.20	0.14	100.41	1.97	0.62	0.36	0.14	2.02	2.94	0.01	8.05	0.63	0.20	0.12	0.04	0.76	0.24
150	7645	29.90	5.42	4.49	1.81	21.68	37.53	0.00	100.84	1.96	0.63	0.38	0.12	2.01	2.95	0.00	8.05	0.63	0.20	0.13	0.04	0.75	0.25

Table 3.11.b: Qualitative trace element analyses of a garnet from sample 208 along traverse A-B (Plate 6.17). Relative concentrations are measured in counts/second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1143	2333	1636	1142	1895	53	2669	1166	2175	1655	1127	1698	109	5543	1145	2181	1568	1036	1717
2	51	1139	2450	1621	1052	1755	54	2720	1109	2133	1697	1092	1746	110	5594	1151	2167	1502	1046	1643
3	103	1107	2368	1616	1062	1751	55	2771	1162	2129	1626	1065	1709	111	5645	1264	2227	1598	1027	1697
4	154	1121	2400	1573	1050	1648	56	2823	1131	2247	1675	1128	1783	112	5697	1177	2200	1556	1021	1655
5	205	1152	2295	1687	1088	1752	57	2874	1121	2137	1545	1116	1732	113	5748	1227	2166	1495	1004	1646
6	257	1134	2245	1627	1085	1795	58	2925	1168	2208	1650	1096	1783	114	5799	1136	2169	1631	997	1694
7	308	1133	2262	1636	1055	1798	59	2977	1172	2129	1613	1127	1729	115	5850	1148	2117	1594	992	1732
8	359	1178	2377	1670	1029	1674	60	3028	1162	2159	1642	1111	1724	116	5902	1194	2178	1568	1046	1635
11	513	1180	2516	1681	1015	1763	61	3079	1172	2265	1612	1097	1711	117	5953	1233	2142	1577	1025	1720
12	565	1246	2414	1496	1009	1650	62	3131	1309	2222	1567	1123	1709	118	6004	1112	2156	1622	1054	1694
13	616	1146	2225	1569	990	1671	63	3182	1219	2189	1526	1166	1731	119	6056	1169	2174	1509	969	1754
14	667	1154	2222	1518	994	1677	65	3284	1111	2236	1698	1113	1666	121	6158	1095	2108	1589	991	1705
15	718	1064	2107	1500	951	1669	72	3644	1209	2240	1537	1173	1631	122	6210	1046	2251	1619	1030	1751
16	770	1154	2183	1591	1029	1724	73	3695	1219	2228	1543	1099	1715	123	6261	1155	2214	1577	1062	1716
17	821	1185	2271	1530	1005	1705	75	3798	1197	2247	1624	1104	1664	124	6312	1190	2309	1552	1027	1750
18	872	1138	2219	1536	1029	1633	76	3849	1208	2189	1536	1078	1762	125	6364	1158	2172	1557	1044	1718
19	924	1227	2092	1549	994	1733	77	3900	1215	2153	1589	1099	1615	126	6415	1127	2214	1516	977	1745
20	975	1164	2155	1621	973	1696	78	3952	1224	2265	1600	1060	1711	127	6466	1131	2227	1672	1032	1666
21	1026	1108	2106	1571	979	1697	79	4003	1194	2188	1637	1081	1717	128	6518	1178	2176	1603	979	1734
22	1078	1117	2258	1698	1006	1678	80	4054	1180	2232	1608	1039	1616	129	6569	1176	2222	1562	962	1715
24	1180	978	1991	1565	958	1634	81	4106	1172	2199	1675	1088	1690	130	6620	1161	2180	1594	990	1698
28	1386	1125	2366	1653	996	1711	82	4157	1115	2225	1616	1060	1780	131	6672	1116	2230	1540	981	1742
29	1437	1119	2330	1606	1025	1721	83	4208	1117	2177	1593	1021	1756	132	6723	1174	2217	1540	911	1765
30	1488	1080	2247	1613	1025	1723	84	4260	1162	2149	1566	1059	1784	133	6774	1147	2201	1622	1015	1751
31	1540	1113	2242	1613	999	1718	85	4311	1168	2146	1567	1154	1795	134	6826	1210	2264	1560	931	1810
32	1591	1143	2360	1678	1029	1715	87	4414	1100	2130	1582	1034	1754	135	6877	1237	2358	1594	948	1768
33	1642	1143	2311	1625	1083	1746	88	4465	1328	2299	1556	1102	1719	136	6928	1185	2391	1651	980	1763
34	1694	1132	2329	1587	1066	1734	89	4516	1548	2277	1603	1114	1675	138	7031	1222	2245	1608	917	1764
35	1745	1146	2378	1634	1081	1662	90	4567	1098	2180	1639	1030	1677	139	7082	1188	2239	1645	967	1686
36	1796	1162	2308	1585	983	1739	91	4619	1133	2213	1576	1060	1731	140	7133	1073	2235	1594	1004	1723
37	1848	1162	2231	1586	1062	1730	92	4670	1240	2190	1645	1038	1691	141	7185	1103	2352	1522	996	1781
38	1899	1169	2201	1622	1063	1770	93	4721	1110	2218	1542	1087	1781	142	7236	1169	2249	1491	971	1722
39	1950	1158	2337	1602	1088	1736	94	4773	1146	2181	1640	1051	1786	143	7287	1158	2292	1526	1054	1724
40	2001	1297	2316	1615	1104	1641	97	4927	1143	2281	1579	1095	1666	144	7339	1108	2330	1506	1019	1802
41	2053	1163	2295	1670	1112	1779	98	4978	1249	2162	1631	1076	1748	145	7390	1179	2242	1485	1030	1739
42	2104	1180	2207	1683	1077	1746	99	5029	1211	2156	1611	994	1693	146	7441	1122	2508	1524	966	1757
43	2155	1143	2228	1654	1108	1734	100	5081	1225	2196	1540	1108	1762	147	7493	1223	2175	1564	1027	1705
44	2207	1152	2258	1586	1089	1757	102	5183	1194	2209	1606	1097	1725	148	7544	1182	2154	1442	1056	1486
45	2258	1187	2246	1678	1069	1704	103	5235	1131	2114	1521	1044	1697	149	7595	1133	2379	1645	1058	1812
46	2309	1152	2128	1479	1024	1781	104	5286	1192	2137	1505	1085	1684	150	7647	1199	2423	1599	1032	1855
49	2463	1129	2173	1584	1064	1632	105	5337	1166	2190	1541	1078	1760							
50	2515	1144	2192	1612	1121	1708	106	5389	1136	2164	1551	1071	1724							
51	2566	1139	2178	1602	1057	1693	107	5440	1162	2171	1536	1053	1757							
52	2617	1180	2277	1590	1043	1756	108	5491	1098	2156	1614	984	1780							

Table 3.12a: Composition of a garnet from sample 208 as analyzed along traverse C-D (Plate 6.17). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	30.68	3.29	3.86	5.12	21.70	37.31	0.08	101.96	2.03	0.39	0.33	0.34	2.02	2.95	0.00	8.05	0.66	0.13	0.11	0.11	0.84	0.16
2	45	30.79	3.51	3.77	4.54	20.94	36.66	0.00	100.21	2.07	0.42	0.32	0.31	1.99	2.95	0.00	8.06	0.66	0.13	0.10	0.10	0.83	0.17
3	89	30.45	3.45	3.84	4.77	21.22	36.91	0.00	100.63	2.04	0.41	0.33	0.32	2.00	2.95	0.00	8.05	0.66	0.13	0.11	0.10	0.83	0.17
5	179	29.69	3.05	3.86	5.12	20.70	35.99	0.00	98.41	2.03	0.37	0.34	0.36	2.00	2.95	0.00	8.05	0.66	0.12	0.11	0.11	0.85	0.15
6	224	29.71	3.38	4.06	4.59	21.21	36.33	0.00	99.29	2.01	0.41	0.35	0.31	2.02	2.94	0.00	8.05	0.65	0.13	0.11	0.10	0.83	0.17
7	268	29.92	3.74	3.69	4.25	20.92	36.60	0.05	99.14	2.02	0.45	0.32	0.29	1.99	2.96	0.00	8.04	0.66	0.15	0.10	0.09	0.82	0.18
8	313	30.43	3.84	3.76	3.98	21.24	37.03	0.00	100.28	2.03	0.46	0.32	0.27	2.00	2.96	0.00	8.04	0.66	0.15	0.10	0.09	0.82	0.18
9	358	30.49	4.28	3.76	3.68	21.62	36.77	0.05	100.59	2.03	0.51	0.32	0.25	2.03	2.93	0.00	8.06	0.65	0.16	0.10	0.08	0.80	0.20
11	447	30.19	3.72	3.95	4.21	21.16	36.68	0.02	99.90	2.03	0.45	0.34	0.29	2.00	2.95	0.00	8.05	0.65	0.14	0.11	0.09	0.82	0.18
12	492	30.49	3.59	3.69	4.53	21.35	36.86	0.11	100.51	2.04	0.43	0.32	0.31	2.01	2.95	0.01	8.05	0.66	0.14	0.10	0.10	0.83	0.17
13	536	30.01	4.08	3.66	4.04	21.56	37.41	0.06	100.76	1.99	0.48	0.31	0.27	2.01	2.96	0.00	8.03	0.65	0.16	0.10	0.09	0.80	0.20
15	626	30.55	4.65	4.08	2.81	21.46	37.36	0.05	100.91	2.02	0.55	0.35	0.19	2.00	2.95	0.00	8.05	0.65	0.18	0.11	0.06	0.79	0.21
16	671	30.00	4.75	4.49	2.48	21.63	37.37	0.00	100.73	1.98	0.56	0.38	0.17	2.01	2.95	0.00	8.05	0.64	0.18	0.12	0.05	0.78	0.22
17	715	29.43	4.83	4.46	2.07	21.35	37.32	0.00	99.47	1.96	0.57	0.38	0.14	2.00	2.97	0.00	8.03	0.64	0.19	0.12	0.05	0.77	0.23
18	760	29.25	5.11	4.57	2.20	21.19	37.27	0.00	99.58	1.95	0.61	0.39	0.15	1.99	2.96	0.00	8.04	0.63	0.20	0.13	0.05	0.76	0.24
19	805	28.93	5.24	4.64	1.98	21.67	37.23	0.25	99.94	1.91	0.62	0.39	0.13	2.02	2.94	0.02	8.03	0.63	0.20	0.13	0.04	0.76	0.24
21	894	29.23	5.53	4.66	1.90	21.69	38.00	0.03	101.00	1.91	0.64	0.39	0.13	2.00	2.97	0.00	8.03	0.62	0.21	0.13	0.04	0.75	0.25
22	939	28.57	5.61	4.74	1.71	21.26	37.55	0.08	99.45	1.89	0.66	0.40	0.11	1.99	2.97	0.00	8.03	0.62	0.22	0.13	0.04	0.74	0.26
23	983	28.75	5.82	4.89	1.76	21.17	37.41	0.00	99.80	1.90	0.69	0.41	0.12	1.97	2.96	0.00	8.05	0.61	0.22	0.13	0.04	0.74	0.26
24	1028	28.83	5.52	4.94	1.62	21.63	37.34	0.01	99.88	1.90	0.65	0.42	0.11	2.01	2.95	0.00	8.04	0.62	0.21	0.14	0.04	0.75	0.25
25	1073	28.72	5.68	5.12	1.58	21.44	37.27	0.00	99.81	1.90	0.67	0.43	0.11	2.00	2.95	0.00	8.05	0.61	0.22	0.14	0.03	0.74	0.26
26	1118	28.19	5.73	5.09	1.67	21.68	37.37	0.04	99.72	1.86	0.67	0.43	0.11	2.02	2.95	0.00	8.04	0.60	0.22	0.14	0.04	0.73	0.27
27	1162	28.50	5.96	4.94	1.51	21.63	37.74	0.00	100.28	1.87	0.70	0.42	0.10	2.00	2.96	0.00	8.04	0.61	0.23	0.13	0.03	0.73	0.27
29	1252	28.90	6.12	4.89	1.46	21.60	37.58	0.10	100.55	1.89	0.71	0.41	0.10	2.00	2.95	0.01	8.06	0.61	0.23	0.13	0.03	0.73	0.27
30	1296	29.08	5.93	5.12	1.58	22.00	37.47	0.16	101.18	1.90	0.69	0.43	0.10	2.02	2.92	0.01	8.07	0.61	0.22	0.14	0.03	0.73	0.27
31	1341	28.71	5.69	5.14	1.53	21.64	37.43	0.06	100.13	1.89	0.67	0.43	0.10	2.01	2.95	0.00	8.05	0.61	0.22	0.14	0.03	0.74	0.26
32	1386	28.31	5.82	5.16	1.68	21.61	37.72	0.05	100.31	1.86	0.68	0.43	0.11	2.00	2.96	0.00	8.04	0.60	0.22	0.14	0.04	0.73	0.27
33	1430	28.38	5.65	4.91	1.68	21.40	37.57	0.33	99.92	1.87	0.66	0.41	0.11	1.99	2.96	0.02	8.03	0.61	0.22	0.14	0.04	0.74	0.26

34	1475	28.14	5.89	4.95	1.66	21.74	37.47	0.07	99.86	1.85	0.69	0.42	0.11	2.02	2.95	0.00	8.04	0.60	0.23	0.14	0.04	0.73	0.27
35	1520	28.57	5.74	5.02	1.59	21.38	37.44	0.00	99.74	1.89	0.68	0.43	0.11	1.99	2.96	0.00	8.05	0.61	0.22	0.14	0.03	0.74	0.26
36	1565	28.68	5.97	4.98	1.70	21.77	37.74	0.06	100.84	1.87	0.69	0.42	0.11	2.00	2.95	0.00	8.05	0.60	0.22	0.13	0.04	0.73	0.27
37	1609	28.25	5.80	5.10	1.62	21.33	37.46	0.01	99.57	1.87	0.68	0.43	0.11	1.99	2.96	0.00	8.04	0.60	0.22	0.14	0.04	0.73	0.27
39	1699	28.32	6.07	5.18	1.53	21.83	37.89	0.08	100.81	1.85	0.70	0.43	0.10	2.01	2.95	0.00	8.04	0.60	0.23	0.14	0.03	0.72	0.28
40	1743	28.11	5.77	5.07	1.52	21.17	37.11	0.00	98.75	1.87	0.69	0.43	0.10	1.99	2.96	0.00	8.05	0.61	0.22	0.14	0.03	0.73	0.27
41	1788	28.37	5.81	5.05	1.54	21.52	37.80	0.00	100.10	1.86	0.68	0.43	0.10	1.99	2.97	0.00	8.03	0.61	0.22	0.14	0.03	0.73	0.27
42	1833	28.42	5.89	5.04	1.42	21.73	37.71	0.00	100.22	1.86	0.69	0.42	0.09	2.01	2.96	0.00	8.04	0.61	0.22	0.14	0.03	0.73	0.27
43	1877	27.91	5.74	5.24	1.54	21.17	37.39	0.01	98.99	1.85	0.68	0.45	0.10	1.98	2.97	0.00	8.04	0.60	0.22	0.14	0.03	0.73	0.27
45	1967	28.36	5.88	5.13	1.49	21.28	37.53	0.08	99.66	1.87	0.69	0.43	0.10	1.98	2.96	0.01	8.05	0.60	0.22	0.14	0.03	0.73	0.27
46	2012	28.38	6.24	5.16	1.45	21.51	37.64	0.07	100.37	1.86	0.73	0.43	0.10	1.99	2.95	0.00	8.06	0.60	0.23	0.14	0.03	0.72	0.28
47	2056	28.31	6.12	5.31	1.35	21.17	37.33	0.11	99.59	1.87	0.72	0.45	0.09	1.97	2.95	0.01	8.06	0.60	0.23	0.14	0.03	0.72	0.28
48	2101	28.44	6.15	5.35	1.33	21.67	37.80	0.00	100.74	1.86	0.72	0.45	0.09	1.99	2.95	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
49	2146	28.07	5.97	5.27	1.52	21.82	37.27	0.04	99.92	1.85	0.70	0.44	0.10	2.02	2.93	0.00	8.05	0.60	0.23	0.14	0.03	0.73	0.27
50	2190	27.54	6.11	5.30	1.43	21.37	36.84	0.00	98.61	1.84	0.73	0.45	0.10	2.01	2.94	0.00	8.06	0.59	0.23	0.15	0.03	0.72	0.28
51	2235	28.19	5.96	5.28	1.40	21.43	37.70	0.03	99.96	1.85	0.70	0.45	0.09	1.99	2.96	0.00	8.04	0.60	0.23	0.14	0.03	0.73	0.27
53	2324	27.88	6.07	5.25	1.47	21.53	37.28	0.06	99.49	1.84	0.72	0.44	0.10	2.01	2.95	0.00	8.05	0.59	0.23	0.14	0.03	0.72	0.28
54	2369	27.69	5.89	5.18	1.72	21.46	37.34	0.00	99.28	1.83	0.69	0.44	0.12	2.00	2.96	0.00	8.04	0.59	0.23	0.14	0.04	0.73	0.27
55	2414	28.33	6.41	5.25	1.37	21.85	37.59	0.00	100.81	1.85	0.75	0.44	0.09	2.01	2.93	0.00	8.06	0.59	0.24	0.14	0.03	0.71	0.29
56	2459	28.06	6.08	5.16	1.62	21.49	37.60	0.04	100.00	1.85	0.71	0.43	0.11	1.99	2.96	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
59	2593	28.69	6.25	5.32	1.52	21.88	38.06	0.20	101.92	1.85	0.72	0.44	0.10	1.99	2.94	0.01	8.05	0.60	0.23	0.14	0.03	0.72	0.28
60	2637	27.99	6.21	5.31	1.58	21.45	37.56	0.08	100.11	1.84	0.73	0.45	0.11	1.99	2.95	0.01	8.06	0.59	0.23	0.14	0.03	0.72	0.28
61	2682	28.22	6.10	5.43	1.54	21.58	37.21	0.08	100.08	1.86	0.72	0.46	0.10	2.00	2.93	0.00	8.07	0.59	0.23	0.15	0.03	0.72	0.28
62	2727	27.91	6.00	5.34	1.39	21.70	37.19	0.01	99.53	1.84	0.71	0.45	0.09	2.02	2.94	0.00	8.05	0.60	0.23	0.15	0.03	0.72	0.28
63	2771	27.81	6.04	5.36	1.36	21.86	37.73	0.11	100.17	1.82	0.71	0.45	0.09	2.02	2.95	0.01	8.04	0.59	0.23	0.15	0.03	0.72	0.28
64	2816	27.65	5.91	5.32	1.49	21.73	37.64	0.08	99.74	1.82	0.69	0.45	0.10	2.01	2.96	0.00	8.03	0.59	0.23	0.15	0.03	0.72	0.28
65	2861	28.14	5.97	5.34	1.47	21.63	37.72	0.07	100.29	1.84	0.70	0.45	0.10	2.00	2.96	0.00	8.04	0.60	0.23	0.15	0.03	0.73	0.27
66	2906	28.22	6.14	5.32	1.45	22.14	37.61	0.02	100.87	1.84	0.71	0.44	0.10	2.03	2.93	0.00	8.05	0.59	0.23	0.14	0.03	0.72	0.28
67	2950	28.15	6.14	5.41	1.61	21.32	37.66	0.06	100.29	1.85	0.72	0.45	0.11	1.97	2.96	0.00	8.06	0.59	0.23	0.15	0.03	0.72	0.28
68	2995	27.93	6.06	5.37	1.29	21.93	37.21	0.09	99.80	1.84	0.71	0.45	0.09	2.03	2.93	0.01	8.05	0.60	0.23	0.15	0.03	0.72	0.28
70	3084	27.82	5.91	5.42	1.38	21.58	37.31	0.01	99.41	1.84	0.70	0.46	0.09	2.01	2.95	0.00	8.05	0.60	0.23	0.15	0.03	0.73	0.27
71	3129	27.86	6.01	5.38	1.42	21.58	37.80	0.02	100.05	1.83	0.70	0.45	0.09	2.00	2.97	0.00	8.04	0.59	0.23	0.15	0.03	0.72	0.28
72	3174	27.88	5.85	5.34	1.54	21.40	37.22	0.00	99.22	1.85	0.69	0.45	0.10	2.00	2.95	0.00	8.05	0.60	0.22	0.15	0.03	0.73	0.27
73	3218	28.28	6.15	5.47	1.61	22.01	38.20	0.01	101.72	1.83	0.71	0.45	0.11	2.00	2.95	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28

74	3263	28.15	5.97	5.26	1.30	21.68	37.36	0.00	99.72	1.86	0.70	0.44	0.09	2.01	2.94	0.00	8.05	0.60	0.23	0.14	0.03	0.73	0.27
75	3308	27.99	5.91	5.23	1.49	21.30	37.46	0.00	99.37	1.85	0.70	0.44	0.10	1.99	2.96	0.00	8.04	0.60	0.23	0.14	0.03	0.73	0.27
76	3353	27.97	6.03	5.21	1.31	21.46	37.44	0.00	99.43	1.85	0.71	0.44	0.09	2.00	2.96	0.00	8.04	0.60	0.23	0.14	0.03	0.72	0.28
77	3397	28.03	6.18	5.24	1.35	21.99	37.63	0.00	100.43	1.83	0.72	0.44	0.09	2.03	2.94	0.00	8.05	0.59	0.23	0.14	0.03	0.72	0.28
78	3442	27.71	5.84	5.51	1.28	21.28	37.22	0.04	98.83	1.84	0.69	0.47	0.09	1.99	2.96	0.00	8.04	0.60	0.22	0.15	0.03	0.73	0.27
79	3487	27.97	6.02	5.44	1.30	21.60	37.32	0.09	99.65	1.85	0.71	0.46	0.09	2.01	2.94	0.01	8.05	0.60	0.23	0.15	0.03	0.72	0.28
80	3531	28.26	5.96	5.34	1.35	21.48	37.51	0.00	99.91	1.86	0.70	0.45	0.09	1.99	2.95	0.00	8.05	0.60	0.23	0.15	0.03	0.73	0.27
81	3576	28.31	5.88	5.31	1.48	21.85	37.72	0.03	100.55	1.85	0.69	0.44	0.10	2.01	2.95	0.00	8.04	0.60	0.22	0.14	0.03	0.73	0.27
82	3621	28.63	6.03	5.42	1.33	21.40	37.41	0.03	100.22	1.88	0.71	0.46	0.09	1.98	2.94	0.00	8.06	0.60	0.23	0.15	0.03	0.73	0.27
83	3665	27.89	5.92	5.39	1.28	21.37	37.22	0.01	99.07	1.85	0.70	0.46	0.09	2.00	2.95	0.00	8.05	0.60	0.23	0.15	0.03	0.73	0.27
84	3710	27.16	6.08	5.11	1.28	21.42	36.55	0.01	97.73	1.82	0.73	0.44	0.09	2.03	2.94	0.00	8.06	0.59	0.24	0.14	0.03	0.71	0.29
85	3755	28.17	6.04	5.30	1.35	21.62	37.80	0.01	100.28	1.85	0.71	0.44	0.09	2.00	2.96	0.00	8.04	0.60	0.23	0.14	0.03	0.72	0.28
86	3800	28.23	5.99	5.38	1.24	21.18	37.16	0.00	99.18	1.87	0.71	0.46	0.08	1.98	2.95	0.00	8.06	0.60	0.23	0.15	0.03	0.73	0.27
87	3844	28.21	6.21	5.47	1.36	21.75	37.77	0.00	100.75	1.84	0.72	0.46	0.09	2.00	2.95	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
88	3889	28.28	6.12	5.32	1.37	21.57	37.53	0.00	100.18	1.86	0.72	0.45	0.09	2.00	2.95	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
89	3934	28.23	6.11	5.26	1.39	21.71	38.20	0.00	100.89	1.84	0.71	0.44	0.09	1.99	2.97	0.00	8.03	0.60	0.23	0.14	0.03	0.72	0.28
90	3978	28.36	6.14	5.12	1.46	21.82	37.23	0.00	100.43	1.86	0.72	0.43	0.10	2.02	2.92	0.00	8.09	0.60	0.23	0.14	0.03	0.72	0.28
91	4023	28.20	6.08	5.36	1.40	21.61	37.48	0.00	100.12	1.85	0.71	0.45	0.09	2.00	2.94	0.00	8.05	0.60	0.23	0.15	0.03	0.72	0.28
92	4068	28.17	6.07	5.47	1.30	21.74	37.52	0.00	100.27	1.85	0.71	0.46	0.09	2.01	2.94	0.00	8.05	0.60	0.23	0.15	0.03	0.72	0.28
93	4112	28.51	5.99	5.38	1.32	21.75	37.62	0.07	100.57	1.87	0.70	0.45	0.09	2.01	2.94	0.00	8.05	0.60	0.23	0.15	0.03	0.73	0.27
94	4157	27.65	6.20	5.37	1.17	21.51	37.43	0.00	99.33	1.83	0.73	0.45	0.08	2.00	2.95	0.00	8.04	0.59	0.24	0.15	0.03	0.71	0.29
95	4202	28.18	6.19	5.22	1.38	21.97	37.59	0.00	100.53	1.84	0.72	0.44	0.09	2.02	2.94	0.00	8.05	0.60	0.23	0.14	0.03	0.72	0.28
96	4247	27.84	5.81	5.33	1.34	21.44	36.98	0.10	98.74	1.85	0.69	0.46	0.09	2.01	2.95	0.01	8.05	0.60	0.22	0.15	0.03	0.73	0.27
97	4291	27.86	5.99	5.21	1.27	21.66	37.52	0.04	99.50	1.84	0.70	0.44	0.08	2.01	2.96	0.00	8.04	0.60	0.23	0.14	0.03	0.72	0.28
98	4336	28.14	6.13	5.30	1.12	21.37	37.32	0.05	99.37	1.86	0.72	0.45	0.07	1.99	2.95	0.00	8.05	0.60	0.23	0.14	0.02	0.72	0.28
99	4381	27.67	5.91	5.37	1.55	21.48	37.13	0.05	99.11	1.84	0.70	0.46	0.10	2.01	2.95	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
100	4425	28.08	6.08	5.39	1.13	21.20	37.23	0.00	99.11	1.86	0.72	0.46	0.08	1.98	2.95	0.00	8.05	0.60	0.23	0.15	0.02	0.72	0.28
101	4470	28.42	6.10	5.42	1.42	21.40	37.82	0.00	100.58	1.86	0.71	0.45	0.09	1.97	2.96	0.00	8.05	0.60	0.23	0.15	0.03	0.72	0.28
102	4515	28.68	5.95	5.32	1.13	21.45	37.54	0.03	100.07	1.89	0.70	0.45	0.08	1.99	2.95	0.00	8.05	0.61	0.22	0.14	0.02	0.73	0.27
103	4559	28.05	5.72	5.32	1.37	21.22	37.43	0.00	99.12	1.86	0.68	0.45	0.09	1.98	2.97	0.00	8.04	0.60	0.22	0.15	0.03	0.73	0.27
104	4604	27.91	6.19	5.49	1.39	21.98	37.82	0.00	100.78	1.82	0.72	0.46	0.09	2.02	2.94	0.00	8.05	0.59	0.23	0.15	0.03	0.72	0.28
105	4649	28.38	6.08	5.48	1.41	21.67	37.94	0.05	100.95	1.85	0.71	0.46	0.09	1.99	2.96	0.00	8.05	0.60	0.23	0.15	0.03	0.72	0.28
106	4694	27.92	5.91	5.63	1.18	21.52	37.25	0.00	99.42	1.85	0.70	0.48	0.08	2.01	2.95	0.00	8.05	0.60	0.22	0.15	0.03	0.73	0.27
107	4738	28.24	5.78	5.21	1.23	21.39	37.47	0.01	99.32	1.87	0.68	0.44	0.08	2.00	2.97	0.00	8.04	0.61	0.22	0.14	0.03	0.73	0.27

108	4783	28.58	6.10	5.46	1.32	21.64	37.77	0.04	100.86	1.87	0.71	0.46	0.09	1.99	2.95	0.00	8.06	0.60	0.23	0.15	0.03	0.72	0.28
109	4828	28.25	5.76	5.41	1.20	21.46	37.45	0.08	99.52	1.87	0.68	0.46	0.08	2.00	2.96	0.00	8.04	0.61	0.22	0.15	0.03	0.73	0.27
110	4872	28.10	6.09	5.45	1.38	21.39	37.30	0.04	99.71	1.86	0.72	0.46	0.09	1.99	2.94	0.00	8.06	0.59	0.23	0.15	0.03	0.72	0.28
112	4962	28.50	5.80	5.46	1.32	21.55	37.77	0.09	100.40	1.87	0.68	0.46	0.09	1.99	2.96	0.01	8.04	0.60	0.22	0.15	0.03	0.73	0.27
113	5006	28.18	5.98	5.52	1.48	21.85	37.94	0.02	101.25	1.83	0.69	0.46	0.10	2.00	2.95	0.00	8.07	0.59	0.22	0.15	0.03	0.73	0.27
114	5051	28.09	5.98	5.54	1.31	21.51	37.38	0.03	99.81	1.85	0.70	0.47	0.09	2.00	2.95	0.00	8.05	0.60	0.23	0.15	0.03	0.72	0.28
115	5096	28.12	5.71	5.54	1.38	21.51	37.42	0.00	99.68	1.86	0.67	0.47	0.09	2.00	2.95	0.00	8.05	0.60	0.22	0.15	0.03	0.73	0.27
117	5185	28.42	5.92	5.71	1.44	21.72	37.84	0.01	101.04	1.85	0.69	0.48	0.09	1.99	2.95	0.00	8.05	0.60	0.22	0.15	0.03	0.73	0.27
118	5230	28.09	5.79	5.71	1.12	21.39	37.76	0.02	99.86	1.85	0.68	0.48	0.07	1.98	2.97	0.00	8.04	0.60	0.22	0.16	0.02	0.73	0.27
119	5275	28.08	5.84	5.80	1.22	21.35	37.53	0.00	99.81	1.85	0.69	0.49	0.08	1.98	2.96	0.00	8.05	0.60	0.22	0.16	0.03	0.73	0.27
120	5319	28.00	5.93	5.74	1.33	21.68	37.99	0.00	100.67	1.83	0.69	0.48	0.09	1.99	2.96	0.00	8.04	0.59	0.22	0.16	0.03	0.73	0.27
121	5364	28.31	5.93	5.87	1.31	21.64	37.46	0.00	100.52	1.86	0.69	0.49	0.09	2.00	2.94	0.00	8.06	0.59	0.22	0.16	0.03	0.73	0.27
123	5453	27.96	5.88	5.75	1.34	21.65	37.88	0.06	100.46	1.83	0.69	0.48	0.09	2.00	2.96	0.00	8.04	0.59	0.22	0.16	0.03	0.73	0.27
124	5498	27.57	5.87	5.62	1.33	21.67	37.29	0.00	99.35	1.82	0.69	0.48	0.09	2.02	2.95	0.00	8.04	0.59	0.22	0.15	0.03	0.72	0.28
125	5543	27.81	5.95	5.43	1.25	21.76	37.54	0.09	99.73	1.83	0.70	0.46	0.08	2.02	2.95	0.01	8.04	0.60	0.23	0.15	0.03	0.72	0.28
126	5588	27.96	5.61	5.50	1.41	21.64	37.30	0.00	99.43	1.85	0.66	0.47	0.09	2.02	2.95	0.00	8.04	0.60	0.22	0.15	0.03	0.74	0.26
127	5632	28.24	5.87	5.55	1.45	21.34	37.57	0.07	100.03	1.86	0.69	0.47	0.10	1.98	2.96	0.00	8.05	0.60	0.22	0.15	0.03	0.73	0.27
128	5677	28.58	5.54	5.27	1.44	20.95	37.01	0.00	98.80	1.91	0.66	0.45	0.10	1.97	2.96	0.00	8.05	0.61	0.21	0.14	0.03	0.74	0.26
129	5722	28.25	5.85	5.07	1.42	21.40	37.41	0.00	99.39	1.87	0.69	0.43	0.10	2.00	2.96	0.00	8.04	0.61	0.22	0.14	0.03	0.73	0.27
130	5766	28.80	5.86	5.14	1.78	21.75	37.81	0.00	101.12	1.88	0.68	0.43	0.12	2.00	2.95	0.00	8.05	0.60	0.22	0.14	0.04	0.73	0.27
131	5811	28.79	5.77	4.85	1.46	21.70	37.57	0.01	100.13	1.89	0.68	0.41	0.10	2.01	2.95	0.00	8.04	0.62	0.22	0.13	0.03	0.74	0.26
132	5856	29.09	5.86	4.79	1.74	21.61	37.44	0.00	100.53	1.91	0.69	0.40	0.12	2.00	2.94	0.00	8.06	0.61	0.22	0.13	0.04	0.74	0.26
133	5900	29.03	5.84	4.65	1.56	21.65	37.39	0.00	100.13	1.91	0.69	0.39	0.10	2.01	2.95	0.00	8.05	0.62	0.22	0.13	0.03	0.74	0.26
134	5945	29.50	5.52	4.82	1.62	21.42	37.71	0.03	100.59	1.94	0.65	0.41	0.11	1.98	2.96	0.00	8.05	0.63	0.21	0.13	0.03	0.75	0.25
135	5990	29.15	5.56	4.56	1.90	21.58	37.47	0.00	100.23	1.92	0.65	0.39	0.13	2.00	2.95	0.00	8.04	0.62	0.21	0.12	0.04	0.75	0.25
136	6035	29.40	5.61	4.61	1.67	21.59	37.30	0.00	100.18	1.94	0.66	0.39	0.11	2.01	2.94	0.00	8.05	0.63	0.21	0.13	0.04	0.75	0.25
137	6079	29.62	5.06	4.54	1.92	21.43	37.14	0.00	99.70	1.97	0.60	0.39	0.13	2.01	2.95	0.00	8.04	0.64	0.19	0.13	0.04	0.77	0.23
138	6124	29.40	5.44	4.56	1.88	21.52	37.29	0.01	100.09	1.94	0.64	0.39	0.13	2.01	2.95	0.00	8.05	0.63	0.21	0.12	0.04	0.75	0.25
139	6169	29.85	5.28	4.52	1.94	21.51	37.30	0.09	100.40	1.97	0.62	0.38	0.13	2.00	2.95	0.01	8.05	0.63	0.20	0.12	0.04	0.76	0.24
140	6213	29.70	5.17	4.63	1.99	21.06	37.00	0.02	99.56	1.98	0.62	0.40	0.13	1.98	2.95	0.00	8.06	0.63	0.20	0.13	0.04	0.76	0.24
142	6303	29.94	5.17	4.73	2.09	21.43	37.39	0.11	100.74	1.97	0.61	0.40	0.14	1.99	2.95	0.01	8.06	0.63	0.19	0.13	0.04	0.76	0.24
143	6347	29.80	4.92	4.71	2.14	21.38	37.15	0.08	100.10	1.98	0.58	0.40	0.14	2.00	2.95	0.00	8.05	0.64	0.19	0.13	0.05	0.77	0.23
144	6392	29.52	4.99	4.56	2.08	21.56	37.08	0.03	99.79	1.96	0.59	0.39	0.14	2.02	2.95	0.00	8.04	0.64	0.19	0.13	0.05	0.77	0.23
145	6437	29.74	4.85	4.63	2.41	21.54	37.70	0.01	100.87	1.96	0.57	0.39	0.16	2.00	2.97	0.00	8.04	0.64	0.18	0.13	0.05	0.77	0.23

146	6482	29.60	4.68	4.51	2.38	21.34	37.12	0.00	99.64	1.97	0.56	0.39	0.16	2.01	2.96	0.00	8.04	0.64	0.18	0.13	0.05	0.78	0.22
147	6526	30.28	4.70	4.25	2.64	21.32	37.22	0.06	100.41	2.01	0.56	0.36	0.18	1.99	2.95	0.00	8.05	0.65	0.18	0.12	0.06	0.78	0.22
148	6571	30.49	4.77	4.12	2.67	21.54	37.11	0.19	100.89	2.01	0.56	0.35	0.18	2.01	2.93	0.01	8.05	0.65	0.18	0.11	0.06	0.78	0.22
149	6616	30.21	4.41	3.91	2.85	21.24	36.79	0.00	99.41	2.03	0.53	0.34	0.19	2.01	2.95	0.00	8.04	0.66	0.17	0.11	0.06	0.79	0.21
150	6660	30.77	3.59	3.77	3.86	21.01	36.47	0.03	99.47	2.08	0.43	0.33	0.26	2.00	2.95	0.00	8.05	0.67	0.14	0.11	0.09	0.83	0.17

Table 3.12.b: Qualitative trace element analyses of a garnet from sample 208 along traverse C-D (Plate 6.17). Relative concentrations are measured in counts/second. **D** = distance from starting point C in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1125	2422	1837	1075	1943	51	2200	1351	2214	1583	1049	1688	97	4224	1174	2257	1557	1105	1763
2	44	1151	2355	1664	1140	1710	52	2244	1147	2248	1662	1008	1718	98	4268	1200	2217	1562	1071	1729
3	88	1194	2445	1818	1199	2049	53	2288	1189	2243	1667	1117	1711	99	4312	1242	2250	1670	1154	1729
4	132	1095	2245	1704	1102	1796	54	2332	1150	2242	1648	1050	1706	100	4356	1144	2181	1564	1059	1641
5	176	1161	2317	1702	1102	1749	55	2376	1187	2372	1636	1110	1669	101	4400	1159	2203	1618	1081	1730
6	220	1120	2294	1940	1104	1801	56	2420	1141	2123	1621	1067	1699	102	4444	1175	2229	1622	1114	1630
7	264	1041	2325	1831	1105	1718	57	2464	1122	2093	1527	1039	1582	103	4488	1040	2088	1631	1076	1757
9	352	1127	2308	1634	1079	1700	58	2508	1145	2205	1586	1115	1723	104	4532	1142	2271	1572	988	1713
10	396	1149	2224	1637	1065	1728	59	2552	1159	2287	1509	1118	1635	105	4576	1102	2177	1617	1062	1678
11	440	1083	2326	1700	1131	1689	60	2596	1185	2163	1661	1105	1702	106	4620	1239	2221	1627	1034	1705
12	484	1064	2367	1957	1088	1764	61	2640	1106	2225	1682	1141	1788	107	4664	1466	2222	1502	1090	1669
14	572	1169	2206	1627	1041	1694	62	2684	1219	2198	1684	1129	1771	108	4708	1147	2255	1571	1041	1735
15	616	1169	2093	1653	987	1730	63	2728	1294	2259	1598	1061	1704	109	4752	1129	2224	1601	1057	1805
16	660	1145	2125	1591	1012	1657	64	2772	1191	2210	1675	1102	1775	110	4796	1135	2185	1549	1055	1762
17	704	1241	2230	1609	1084	1732	65	2816	1239	2200	1653	1164	1755	111	4840	1098	2176	1644	1107	1771
18	748	1167	2215	1655	1009	1722	66	2860	1204	2200	1649	1137	1762	112	4884	1182	2111	1569	1035	1783
19	792	1282	2175	1577	1010	1721	68	2948	1268	2144	1645	1083	1651	113	4928	1226	2088	1561	1037	1739
21	880	1362	2152	1649	1016	1682	69	2992	1318	2226	1681	1076	1714	114	4972	1165	2146	1607	1081	1716
22	924	1179	2225	1568	1008	1741	70	3036	1258	2122	1646	1078	1737	115	5016	1099	2182	1632	1068	1700
23	968	1205	2189	1585	998	1690	72	3124	1137	2262	1549	1148	1662	116	5060	1195	2186	1520	1070	1667
24	1012	1137	2203	1608	997	1689	73	3168	1177	2346	1534	1105	1696	117	5104	1136	2116	1563	1020	1760
25	1056	1227	2316	1601	1040	1743	74	3212	1183	2210	1629	1097	1712	118	5148	1173	2137	1622	1032	1735
26	1100	1164	2295	1609	1073	1740	75	3256	1135	2222	1576	1072	1677	119	5192	1241	2139	1604	1078	1672
27	1144	1143	2304	1514	1058	1753	76	3300	1122	2252	1525	1117	1613	120	5236	1144	2173	1523	1085	1711
28	1188	1219	2188	1508	983	1689	77	3344	1119	2190	1599	1014	1787	121	5280	1210	2259	1600	1139	1812
29	1232	1193	2139	1640	996	1673	78	3388	1056	2162	1612	1119	1764	123	5368	1165	2223	1664	1082	1703
31	1320	1006	2026	1414	912	1778	79	3432	1197	2255	1624	1119	1746	124	5412	1180	2170	1574	1094	1663
32	1364	1205	2332	1545	1077	1733	80	3476	1443	2215	1553	1067	1759	125	5456	1176	2191	1536	1029	1711
33	1408	1253	2203	1629	1095	1742	81	3520	1157	2240	1641	1064	1644	126	5500	1171	2141	1553	1014	1693
34	1452	1120	2238	1612	1019	1702	82	3564	1152	2149	1586	1044	1755	127	5544	1116	2167	1487	1066	1705
35	1496	1098	2254	1548	1012	1715	83	3608	1110	2065	1568	1075	1655	129	5632	1180	2149	1558	1022	1741
36	1540	1192	2164	1595	1041	1704	84	3652	1178	2301	1571	1079	1834	130	5676	1139	2231	1527	989	1762
37	1584	1135	2140	1672	1023	1645	85	3696	1237	2203	1618	1025	1675	131	5720	1118	2229	1564	1038	1732
38	1628	1163	2301	1546	1071	1751	86	3740	1245	2192	1564	1071	1657	132	5764	1151	2258	1593	1035	1723
39	1672	1171	2248	1571	1042	1628	87	3784	1172	2116	1630	1031	1693	134	5852	1140	2252	1534	1051	1670
40	1716	1121	2260	1550	1047	1712	88	3828	1201	2216	1552	1146	1660	135	5896	1147	2318	1603	1056	1744
42	1804	1140	2273	1647	1082	1692	89	3872	1197	2245	1635	1076	1661	136	5940	1146	2291	1591	1011	1658
43	1848	1278	2311	1518	1114	1740	90	3916	1195	2168	1643	1139	1661	137	5984	1206	2243	1695	1071	1759
44	1892	1147	2326	1596	1104	1648	91	3960	1079	2162	1598	1052	1726	138	6028	1185	2311	1613	1061	1714
45	1936	1190	2323	1627	1064	1732	92	4004	1059	2165	1638	1013	1736	139	6072	1154	2181	1637	1033	1747
47	2024	1149	2258	1576	994	1700	93	4048	1150	2188	1637	1065	1768	140	6116	1126	2222	1620	1039	1658
48	2068	1152	2277	1693	1071	1645	94	4092	1286	2186	1657	1105	1721	141	6160	1145	2244	1571	1018	1697
49	2112	1083	2232	1714	999	1682	95	4136	1195	2217	1630	1101	1740	142	6204	1113	2212	1585	1002	1728
50	2156	1121	2248	1650	1036	1672	96	4180	1176	2199	1598	1074	1698	143	6248	1192	2291	1547	988	1680

144	6292	1186	2233	1689	1007	1692	147	6424	1134	2202	1560	1055	1760	150	6556	1154	2242	1633	1073	1808
145	6336	1166	2266	1563	1030	1812	148	6468	1246	2255	1603	1052	1736							
146	6380	1183	2211	1584	1057	1787	149	6512	1194	2232	1500	1026	1751							

Table 3.13a: Composition of Garnet I from sample 282 as analyzed along traverse A-B (Plate 6.8). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	34.53	4.15	3.33	0.69	21.76	38.37	0.16	102.84	2.24	0.48	0.28	0.05	1.99	2.98	0.01	8.02	0.74	0.16	0.09	0.01	0.82	0.18
2	37	32.55	4.87	3.70	0.73	21.34	38.31	0.00	101.50	2.13	0.57	0.31	0.05	1.97	3.00	0.00	8.02	0.70	0.19	0.10	0.02	0.79	0.21
3	75	32.96	5.00	3.35	0.80	21.20	37.90	0.00	101.22	2.17	0.59	0.28	0.05	1.97	2.98	0.00	8.04	0.70	0.19	0.09	0.02	0.79	0.21
4	112	33.23	4.56	3.21	0.74	21.21	37.88	0.00	100.82	2.20	0.54	0.27	0.05	1.97	2.99	0.00	8.02	0.72	0.18	0.09	0.02	0.80	0.20
6	187	34.90	3.62	3.34	0.87	21.22	37.64	0.00	101.60	2.31	0.43	0.28	0.06	1.98	2.98	0.00	8.03	0.75	0.14	0.09	0.02	0.84	0.16
7	225	32.80	5.06	3.27	0.83	21.23	37.88	0.00	101.08	2.16	0.59	0.28	0.06	1.97	2.98	0.00	8.03	0.70	0.19	0.09	0.02	0.78	0.22
8	262	32.27	5.29	3.26	0.66	21.41	38.76	0.04	101.66	2.10	0.61	0.27	0.04	1.96	3.01	0.00	8.00	0.69	0.20	0.09	0.01	0.77	0.23
10	337	32.23	5.56	3.36	0.75	21.33	38.40	0.07	101.62	2.10	0.65	0.28	0.05	1.96	2.99	0.00	8.03	0.68	0.21	0.09	0.02	0.76	0.24
11	375	31.38	5.55	3.47	0.69	21.60	38.26	0.03	100.96	2.05	0.65	0.29	0.05	1.99	2.99	0.00	8.01	0.68	0.21	0.10	0.02	0.76	0.24
12	412	31.86	5.88	3.32	0.71	21.62	38.15	0.00	101.54	2.07	0.68	0.28	0.05	1.98	2.97	0.00	8.04	0.67	0.22	0.09	0.02	0.75	0.25
13	450	30.74	5.80	3.38	0.69	21.43	37.87	0.00	99.92	2.03	0.68	0.29	0.05	1.99	2.99	0.00	8.02	0.67	0.22	0.09	0.02	0.75	0.25
14	487	31.25	6.12	3.40	0.80	21.52	38.32	0.05	101.40	2.03	0.71	0.28	0.05	1.97	2.98	0.00	8.03	0.66	0.23	0.09	0.02	0.74	0.26
15	524	31.25	6.08	3.62	0.66	21.58	38.36	0.02	101.54	2.03	0.70	0.30	0.04	1.98	2.98	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
16	562	31.66	6.12	3.49	0.64	21.71	38.35	0.02	101.98	2.05	0.71	0.29	0.04	1.98	2.97	0.00	8.04	0.66	0.23	0.09	0.01	0.74	0.26
17	599	31.23	5.91	3.69	0.64	21.43	38.25	0.06	101.14	2.04	0.69	0.31	0.04	1.97	2.98	0.00	8.03	0.66	0.22	0.10	0.01	0.75	0.25
20	712	31.16	5.85	3.71	0.72	21.14	37.90	0.01	100.48	2.05	0.69	0.31	0.05	1.96	2.98	0.00	8.04	0.66	0.22	0.10	0.02	0.75	0.25
21	749	30.91	5.67	3.79	0.58	21.16	38.20	0.03	100.32	2.03	0.66	0.32	0.04	1.96	3.00	0.00	8.02	0.67	0.22	0.10	0.01	0.75	0.25
22	787	30.77	6.01	3.70	0.60	21.46	38.20	0.02	100.74	2.01	0.70	0.31	0.04	1.98	2.99	0.00	8.02	0.66	0.23	0.10	0.01	0.74	0.26
23	824	30.92	6.01	3.71	0.69	21.33	38.41	0.00	101.08	2.02	0.70	0.31	0.05	1.96	2.99	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
24	862	31.18	5.99	3.70	0.55	21.54	38.75	0.00	101.72	2.02	0.69	0.31	0.04	1.97	3.00	0.00	8.02	0.66	0.23	0.10	0.01	0.74	0.26
25	899	30.55	6.05	3.70	0.66	21.45	38.43	0.00	100.84	1.99	0.70	0.31	0.04	1.97	3.00	0.00	8.02	0.65	0.23	0.10	0.01	0.74	0.26
26	937	31.04	6.14	3.86	0.61	21.54	38.83	0.01	102.02	2.00	0.71	0.32	0.04	1.96	3.00	0.00	8.02	0.65	0.23	0.10	0.01	0.74	0.26
27	974	30.92	5.99	3.76	0.58	21.42	38.15	0.04	100.82	2.02	0.70	0.32	0.04	1.97	2.98	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
30	1086	30.90	5.89	3.68	0.69	21.29	38.31	0.13	100.76	2.02	0.69	0.31	0.05	1.96	3.00	0.01	8.02	0.66	0.22	0.10	0.02	0.75	0.25
31	1124	31.48	6.05	3.73	0.71	21.91	38.59	0.00	102.48	2.03	0.69	0.31	0.05	1.99	2.97	0.00	8.03	0.66	0.23	0.10	0.02	0.74	0.26
32	1161	31.86	6.06	3.74	0.73	21.53	38.54	0.01	102.46	2.06	0.70	0.31	0.05	1.96	2.98	0.00	8.05	0.66	0.22	0.10	0.02	0.75	0.25
33	1199	31.06	6.20	3.76	0.69	21.37	38.44	0.04	101.52	2.02	0.72	0.31	0.05	1.96	2.99	0.00	8.04	0.65	0.23	0.10	0.01	0.74	0.26
34	1236	31.22	5.98	3.74	0.70	21.44	38.22	0.08	101.32	2.03	0.69	0.31	0.05	1.97	2.98	0.00	8.04	0.66	0.22	0.10	0.02	0.75	0.25

35	1274	30.78	6.05	3.66	0.69	21.58	38.33	0.03	101.10	2.00	0.70	0.31	0.05	1.98	2.99	0.00	8.02	0.66	0.23	0.10	0.01	0.74	0.26
36	1311	31.18	5.99	3.99	0.58	21.39	38.39	0.02	101.52	2.03	0.69	0.33	0.04	1.96	2.98	0.00	8.04	0.66	0.22	0.11	0.01	0.74	0.26
37	1349	30.53	5.99	3.87	0.68	21.19	38.46	0.02	100.72	2.00	0.70	0.32	0.04	1.95	3.01	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
38	1386	30.89	6.03	4.01	0.61	21.34	37.84	0.00	100.72	2.03	0.70	0.34	0.04	1.97	2.97	0.00	8.05	0.65	0.23	0.11	0.01	0.74	0.26
39	1423	30.82	6.08	3.90	0.60	21.53	38.57	0.00	101.50	2.00	0.70	0.32	0.04	1.97	2.99	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
40	1461	31.32	6.05	4.04	0.65	21.27	38.55	0.00	101.88	2.03	0.70	0.34	0.04	1.94	2.99	0.00	8.04	0.65	0.23	0.11	0.01	0.74	0.26
41	1498	30.80	5.99	4.06	0.67	21.48	38.34	0.12	101.32	2.00	0.69	0.34	0.04	1.97	2.98	0.01	8.03	0.65	0.23	0.11	0.01	0.74	0.26
42	1536	30.65	5.95	3.85	0.54	21.34	38.40	0.00	100.72	2.00	0.69	0.32	0.04	1.96	3.00	0.00	8.02	0.66	0.23	0.11	0.01	0.74	0.26
43	1573	31.25	6.08	4.08	0.72	21.54	38.88	0.11	102.56	2.01	0.70	0.34	0.05	1.95	2.99	0.01	8.03	0.65	0.23	0.11	0.02	0.74	0.26
44	1611	30.68	5.92	4.33	0.68	21.35	37.95	0.00	100.92	2.01	0.69	0.36	0.05	1.97	2.97	0.00	8.05	0.65	0.22	0.12	0.01	0.74	0.26
45	1648	31.05	5.93	4.01	0.70	21.34	38.82	0.11	101.86	2.01	0.68	0.33	0.05	1.95	3.00	0.01	8.02	0.65	0.22	0.11	0.01	0.75	0.25
46	1686	30.54	5.92	4.28	0.71	21.53	38.56	0.00	101.56	1.98	0.68	0.36	0.05	1.97	2.99	0.00	8.03	0.65	0.22	0.12	0.02	0.74	0.26
47	1723	31.13	5.93	4.03	0.67	21.23	38.37	0.00	101.36	2.03	0.69	0.34	0.04	1.95	2.99	0.00	8.04	0.65	0.22	0.11	0.01	0.75	0.25
48	1761	30.49	5.84	3.96	0.69	21.53	38.36	0.24	100.86	1.99	0.68	0.33	0.05	1.98	2.99	0.01	8.02	0.65	0.22	0.11	0.01	0.75	0.25
49	1798	30.45	6.18	3.99	0.69	21.31	37.93	0.36	100.90	1.99	0.72	0.33	0.05	1.96	2.96	0.02	8.03	0.64	0.23	0.11	0.01	0.73	0.27
50	1836	30.47	6.01	4.08	0.67	21.43	38.56	0.08	101.22	1.98	0.70	0.34	0.04	1.96	3.00	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
51	1873	30.66	5.85	4.19	0.65	21.21	38.11	0.05	100.68	2.01	0.68	0.35	0.04	1.96	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.75	0.25
52	1910	30.97	6.10	4.08	0.67	21.43	38.60	0.04	101.84	2.01	0.70	0.34	0.04	1.96	2.99	0.00	8.03	0.65	0.23	0.11	0.01	0.74	0.26
53	1948	30.71	5.93	4.04	0.68	21.32	38.27	0.03	100.96	2.01	0.69	0.34	0.05	1.96	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.74	0.26
54	1985	30.91	5.79	4.16	0.69	21.21	38.27	0.12	101.04	2.02	0.67	0.35	0.05	1.95	2.99	0.01	8.03	0.65	0.22	0.11	0.01	0.75	0.25
55	2023	31.00	5.82	4.10	0.62	20.99	38.13	0.00	100.66	2.03	0.68	0.34	0.04	1.94	2.99	0.00	8.04	0.66	0.22	0.11	0.01	0.75	0.25
56	2060	30.97	5.46	4.10	0.75	20.95	37.95	0.00	100.18	2.05	0.64	0.35	0.05	1.95	3.00	0.00	8.03	0.66	0.21	0.11	0.02	0.76	0.24
57	2098	31.05	5.75	3.96	0.62	21.52	38.08	0.00	100.98	2.03	0.67	0.33	0.04	1.98	2.98	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
58	2135	30.80	5.72	4.11	0.81	21.34	38.32	0.07	101.10	2.01	0.67	0.34	0.05	1.96	2.99	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
60	2210	30.39	5.90	4.08	0.77	21.79	38.56	0.61	102.10	1.96	0.68	0.34	0.05	1.98	2.97	0.04	8.01	0.65	0.22	0.11	0.02	0.74	0.26
62	2285	30.66	5.72	4.08	0.78	21.54	38.49	0.00	101.26	1.99	0.66	0.34	0.05	1.97	2.99	0.00	8.02	0.65	0.22	0.11	0.02	0.75	0.25
63	2323	30.96	5.90	4.19	0.46	21.67	38.55	0.06	101.72	2.00	0.68	0.35	0.03	1.98	2.98	0.00	8.03	0.65	0.22	0.11	0.01	0.75	0.25
64	2360	30.95	5.84	4.02	0.65	21.02	38.57	0.00	101.04	2.02	0.68	0.34	0.04	1.93	3.01	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
65	2397	30.79	5.87	4.13	0.62	21.52	38.45	0.08	101.40	2.00	0.68	0.34	0.04	1.97	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.75	0.25
67	2472	30.96	5.94	4.08	0.55	21.30	38.22	0.00	101.04	2.02	0.69	0.34	0.04	1.96	2.98	0.00	8.04	0.65	0.22	0.11	0.01	0.75	0.25
68	2510	30.69	5.80	4.07	0.59	20.78	38.28	0.03	100.22	2.02	0.68	0.34	0.04	1.93	3.01	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
69	2547	30.72	5.79	4.06	0.79	21.34	38.52	0.06	101.22	2.00	0.67	0.34	0.05	1.96	3.00	0.00	8.02	0.65	0.22	0.11	0.02	0.75	0.25
70	2585	31.28	5.94	4.09	0.56	21.74	38.67	0.00	102.28	2.02	0.68	0.34	0.04	1.98	2.98	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
72	2660	30.96	5.82	4.04	0.62	21.55	38.48	0.01	101.46	2.01	0.67	0.34	0.04	1.97	2.99	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25

73	2697	31.19	5.77	3.96	0.73	21.42	38.37	0.03	101.44	2.03	0.67	0.33	0.05	1.97	2.99	0.00	8.03	0.66	0.22	0.11	0.02	0.75	0.25
74	2735	31.07	6.12	4.11	0.71	21.37	38.47	0.03	101.86	2.01	0.71	0.34	0.05	1.95	2.98	0.00	8.04	0.65	0.23	0.11	0.02	0.74	0.26
75	2772	31.45	5.63	4.05	0.67	21.62	37.91	0.08	101.34	2.05	0.66	0.34	0.04	1.99	2.96	0.00	8.04	0.66	0.21	0.11	0.01	0.76	0.24
77	2847	32.44	5.10	4.00	0.65	21.31	38.21	0.17	101.72	2.12	0.59	0.33	0.04	1.96	2.98	0.01	8.04	0.69	0.19	0.11	0.01	0.78	0.22
78	2884	31.99	5.17	3.92	0.77	21.31	38.21	0.03	101.38	2.09	0.60	0.33	0.05	1.96	2.99	0.00	8.03	0.68	0.20	0.11	0.02	0.78	0.22
79	2922	31.13	5.67	4.15	0.58	21.56	38.58	0.00	101.66	2.02	0.66	0.34	0.04	1.97	2.99	0.00	8.02	0.66	0.21	0.11	0.01	0.75	0.25
80	2959	30.79	5.91	4.04	0.71	21.45	38.44	0.07	101.34	2.00	0.68	0.34	0.05	1.97	2.99	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
81	2997	30.65	5.93	4.07	0.61	21.62	38.31	0.05	101.20	1.99	0.69	0.34	0.04	1.98	2.98	0.00	8.03	0.65	0.22	0.11	0.01	0.74	0.26
82	3034	30.39	5.69	4.14	0.76	21.14	38.19	0.00	100.32	2.00	0.67	0.35	0.05	1.96	3.00	0.00	8.02	0.65	0.22	0.11	0.02	0.75	0.25
83	3072	30.64	5.76	4.29	0.60	21.39	38.37	0.03	101.06	2.00	0.67	0.36	0.04	1.97	2.99	0.00	8.02	0.65	0.22	0.12	0.01	0.75	0.25
84	3109	30.60	5.54	4.22	0.69	21.22	38.34	0.00	100.62	2.00	0.65	0.35	0.05	1.96	3.00	0.00	8.02	0.66	0.21	0.12	0.02	0.76	0.24
85	3147	30.84	5.66	4.23	0.61	21.12	38.52	0.00	100.98	2.01	0.66	0.35	0.04	1.94	3.01	0.00	8.02	0.66	0.21	0.12	0.01	0.75	0.25
86	3184	31.11	5.79	4.17	0.70	21.15	38.21	0.00	101.14	2.03	0.67	0.35	0.05	1.95	2.99	0.00	8.04	0.66	0.22	0.11	0.01	0.75	0.25
87	3222	30.90	5.90	4.09	0.64	21.35	38.85	0.07	101.74	2.00	0.68	0.34	0.04	1.95	3.01	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
88	3259	30.96	5.93	4.28	0.55	21.24	38.30	0.05	101.26	2.02	0.69	0.36	0.04	1.95	2.99	0.00	8.04	0.65	0.22	0.12	0.01	0.75	0.25
89	3296	31.01	5.77	4.33	0.62	21.07	38.63	0.00	101.42	2.02	0.67	0.36	0.04	1.93	3.01	0.00	8.03	0.65	0.22	0.12	0.01	0.75	0.25
90	3334	30.58	5.74	4.23	0.70	21.25	37.98	0.04	100.48	2.01	0.67	0.36	0.05	1.97	2.98	0.00	8.03	0.65	0.22	0.12	0.02	0.75	0.25
91	3371	30.40	6.05	4.08	0.67	21.55	38.37	0.00	101.10	1.98	0.70	0.34	0.04	1.98	2.99	0.00	8.03	0.65	0.23	0.11	0.01	0.74	0.26
92	3409	30.84	6.01	4.22	0.71	21.41	38.73	0.01	101.92	1.99	0.69	0.35	0.05	1.95	2.99	0.00	8.03	0.65	0.22	0.11	0.02	0.74	0.26
93	3446	30.54	5.83	4.17	0.62	20.97	38.37	0.08	100.50	2.00	0.68	0.35	0.04	1.94	3.01	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
94	3484	31.18	5.95	4.15	0.39	21.63	38.63	0.02	101.94	2.02	0.69	0.34	0.03	1.97	2.99	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
96	3559	30.39	6.00	4.17	0.72	21.50	38.14	0.10	100.90	1.98	0.70	0.35	0.05	1.98	2.98	0.01	8.03	0.64	0.23	0.11	0.02	0.74	0.26
97	3596	31.12	5.53	4.01	0.51	21.47	38.71	0.29	101.64	2.02	0.64	0.33	0.03	1.96	3.00	0.02	8.00	0.67	0.21	0.11	0.01	0.76	0.24
98	3634	30.73	5.59	3.92	0.71	21.34	38.50	0.24	100.80	2.01	0.65	0.33	0.05	1.97	3.01	0.01	8.01	0.66	0.21	0.11	0.02	0.76	0.24
99	3671	30.95	5.80	4.08	0.54	21.34	38.29	0.12	101.00	2.02	0.68	0.34	0.04	1.96	2.99	0.01	8.03	0.66	0.22	0.11	0.01	0.75	0.25
100	3709	31.26	5.88	3.99	0.68	21.34	38.56	0.00	101.70	2.03	0.68	0.33	0.04	1.95	2.99	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
101	3746	31.07	5.76	4.15	0.68	21.51	38.89	0.03	102.08	2.01	0.66	0.34	0.04	1.96	3.00	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
102	3783	30.70	5.70	4.07	0.63	21.22	38.35	0.05	100.68	2.01	0.67	0.34	0.04	1.96	3.00	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
103	3821	30.44	5.65	4.16	0.62	21.07	38.32	0.03	100.26	2.00	0.66	0.35	0.04	1.95	3.01	0.00	8.01	0.66	0.22	0.11	0.01	0.75	0.25
104	3858	31.15	5.97	4.10	0.94	21.44	38.39	0.11	102.00	2.02	0.69	0.34	0.06	1.96	2.98	0.01	8.05	0.65	0.22	0.11	0.02	0.75	0.25
105	3896	30.90	5.93	4.06	0.70	21.63	38.50	0.01	101.72	2.00	0.68	0.34	0.05	1.98	2.98	0.00	8.03	0.65	0.22	0.11	0.01	0.75	0.25
106	3933	31.00	5.75	4.21	0.68	21.14	38.19	0.00	100.98	2.03	0.67	0.35	0.05	1.95	2.99	0.00	8.04	0.65	0.22	0.11	0.01	0.75	0.25
107	3971	30.69	5.89	4.00	0.70	21.22	38.79	0.09	101.30	1.99	0.68	0.33	0.05	1.94	3.01	0.01	8.01	0.65	0.22	0.11	0.02	0.75	0.25
108	4008	30.85	5.95	3.91	0.65	21.49	38.35	0.04	101.20	2.01	0.69	0.33	0.04	1.97	2.99	0.00	8.03	0.65	0.23	0.11	0.01	0.74	0.26

109	4046	30.81	5.93	4.00	0.62	21.22	38.19	0.08	100.76	2.02	0.69	0.34	0.04	1.96	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.74	0.26
110	4083	30.93	5.89	3.97	0.49	21.60	38.52	0.03	101.40	2.01	0.68	0.33	0.03	1.98	2.99	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
113	4196	30.44	6.02	4.04	0.80	21.47	38.64	0.00	101.40	1.97	0.70	0.34	0.05	1.96	3.00	0.00	8.02	0.65	0.23	0.11	0.02	0.74	0.26
114	4233	30.60	5.85	4.00	0.62	21.21	38.50	0.02	100.78	2.00	0.68	0.34	0.04	1.95	3.01	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
115	4270	31.11	5.96	3.94	0.68	21.25	38.37	0.03	101.32	2.03	0.69	0.33	0.04	1.95	2.99	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
116	4308	30.78	5.89	4.07	0.81	21.41	38.46	0.00	101.42	2.00	0.68	0.34	0.05	1.96	2.99	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
117	4345	30.60	5.92	4.04	0.63	21.38	38.48	0.00	101.06	1.99	0.69	0.34	0.04	1.96	3.00	0.00	8.02	0.65	0.22	0.11	0.01	0.74	0.26
118	4383	30.70	5.93	4.05	0.61	21.17	37.98	0.04	100.46	2.02	0.69	0.34	0.04	1.96	2.98	0.00	8.04	0.65	0.22	0.11	0.01	0.74	0.26
120	4458	30.55	6.05	4.03	0.76	21.68	38.55	0.03	101.62	1.98	0.70	0.33	0.05	1.98	2.99	0.00	8.03	0.65	0.23	0.11	0.02	0.74	0.26
121	4495	30.71	5.86	4.05	0.60	21.40	38.39	0.00	101.00	2.00	0.68	0.34	0.04	1.97	2.99	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
122	4533	30.96	5.76	4.03	0.69	21.54	38.79	0.13	101.76	2.00	0.66	0.33	0.05	1.96	3.00	0.01	8.02	0.66	0.22	0.11	0.01	0.75	0.25
123	4570	30.56	5.87	4.03	0.53	21.39	38.26	0.10	100.64	2.00	0.69	0.34	0.03	1.97	2.99	0.01	8.02	0.65	0.22	0.11	0.01	0.74	0.26
124	4608	30.77	5.90	4.15	0.62	21.56	38.72	0.03	101.72	1.99	0.68	0.34	0.04	1.97	3.00	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
126	4683	30.42	5.95	4.02	0.78	21.48	38.50	0.00	101.16	1.98	0.69	0.33	0.05	1.97	2.99	0.00	8.02	0.65	0.23	0.11	0.02	0.74	0.26
127	4720	30.17	5.90	4.05	0.67	21.63	38.48	0.09	100.90	1.96	0.68	0.34	0.04	1.99	3.00	0.01	8.01	0.65	0.23	0.11	0.01	0.74	0.26
129	4795	30.64	6.02	4.00	0.73	21.72	38.92	0.00	102.04	1.97	0.69	0.33	0.05	1.97	3.00	0.00	8.01	0.65	0.23	0.11	0.02	0.74	0.26
130	4832	30.65	5.91	4.16	0.65	21.52	38.59	0.00	101.48	1.99	0.68	0.35	0.04	1.97	2.99	0.00	8.02	0.65	0.22	0.11	0.01	0.74	0.26
131	4870	30.70	5.88	4.02	0.66	21.39	38.34	0.03	100.98	2.00	0.68	0.34	0.04	1.97	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.75	0.25
132	4907	30.48	5.95	3.86	0.64	21.44	38.20	0.07	100.58	1.99	0.69	0.32	0.04	1.98	2.99	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
133	4945	30.87	5.91	3.86	0.71	21.78	38.72	0.00	101.86	1.99	0.68	0.32	0.05	1.98	2.99	0.00	8.02	0.66	0.22	0.11	0.02	0.75	0.25
134	4982	30.57	5.87	3.94	0.60	21.23	38.48	0.06	100.68	2.00	0.68	0.33	0.04	1.96	3.01	0.00	8.01	0.65	0.22	0.11	0.01	0.75	0.25
135	5020	30.85	5.63	3.95	0.67	21.13	38.43	0.00	100.66	2.02	0.66	0.33	0.04	1.95	3.01	0.00	8.01	0.66	0.22	0.11	0.01	0.75	0.25
136	5057	30.78	6.05	3.85	0.78	21.40	38.71	0.00	101.56	2.00	0.70	0.32	0.05	1.96	3.00	0.00	8.02	0.65	0.23	0.10	0.02	0.74	0.26
137	5095	30.93	5.70	3.92	0.57	21.00	38.26	0.06	100.40	2.03	0.67	0.33	0.04	1.95	3.01	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
138	5132	30.94	5.92	3.77	0.65	21.45	38.29	0.00	101.02	2.02	0.69	0.32	0.04	1.97	2.99	0.00	8.03	0.66	0.22	0.10	0.01	0.75	0.25
140	5207	30.77	5.70	3.91	0.62	21.30	38.51	0.07	100.80	2.01	0.66	0.33	0.04	1.96	3.01	0.00	8.01	0.66	0.22	0.11	0.01	0.75	0.25
141	5244	30.46	6.01	3.76	0.68	21.32	38.37	0.13	100.60	1.99	0.70	0.31	0.05	1.96	3.00	0.01	8.02	0.65	0.23	0.10	0.01	0.74	0.26
143	5319	31.07	6.13	3.79	0.77	21.71	38.15	0.00	101.62	2.02	0.71	0.32	0.05	1.99	2.96	0.00	8.04	0.65	0.23	0.10	0.02	0.74	0.26
144	5357	31.45	6.18	3.55	0.70	21.83	38.64	0.07	102.36	2.03	0.71	0.29	0.05	1.98	2.98	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
145	5394	31.26	5.99	3.74	0.51	21.66	38.17	0.00	101.32	2.04	0.70	0.31	0.03	1.99	2.97	0.00	8.03	0.66	0.23	0.10	0.01	0.75	0.25
146	5432	30.67	5.90	3.58	0.80	21.29	38.45	0.00	100.70	2.01	0.69	0.30	0.05	1.96	3.01	0.00	8.01	0.66	0.23	0.10	0.02	0.74	0.26
147	5469	30.93	5.97	3.50	0.55	21.27	38.25	0.10	100.46	2.03	0.70	0.29	0.04	1.97	3.00	0.01	8.02	0.66	0.23	0.10	0.01	0.74	0.26
148	5507	31.53	6.12	3.78	0.70	21.60	38.81	0.01	102.54	2.03	0.70	0.31	0.05	1.96	2.99	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
149	5544	30.65	5.94	3.57	0.64	21.40	38.38	0.13	100.58	2.00	0.69	0.30	0.04	1.97	3.00	0.01	8.01	0.66	0.23	0.10	0.01	0.74	0.26
150	5582	31.05	6.12	3.48	0.58	21.44	38.70	0.13	101.38	2.02	0.71	0.29	0.04	1.96	3.00	0.01	8.02	0.66	0.23	0.09	0.01	0.74	0.26

Table 3.13.b: Qualitative trace element analyses of Garnet I from sample 282 along traverse A-B (Plate 6.8). Relative concentrations are measured in counts/second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1107	2403	1320	2649	1658	56	2060	1087	2339	1286	2652	1590	108	4008	1099	2353	1325	2489	1525
2	37	1121	2201	1270	2695	1638	57	2098	1003	2320	1386	2533	1573	109	4046	1076	2353	1324	2766	1545
3	75	1047	2409	1273	2776	1551	58	2135	1034	2314	1422	2669	1604	110	4083	1080	2301	1344	2612	1517
4	112	1101	2295	1211	2669	1587	60	2210	1092	2338	1886	2513	1536	111	4121	1042	2260	1336	2646	1560
6	187	1092	2251	1256	2763	1675	62	2285	1060	2335	1220	2566	1517	112	4158	1072	2316	1227	2674	1605
7	225	1029	2294	1230	2750	1545	63	2323	1023	2120	1235	2438	1165	113	4196	997	2314	1225	2634	1588
9	300	1047	2368	1267	2731	1573	64	2360	1081	2270	1234	2528	1545	114	4233	1057	2331	1269	2639	1521
10	337	1118	2289	1268	2718	1616	65	2397	1016	2202	1307	2613	1510	115	4270	1058	2298	1174	2709	1566
11	375	1059	2261	1287	2715	1553	67	2472	1055	2358	1340	2566	1571	116	4308	1078	2335	1244	2555	1568
12	412	1022	2293	1189	2684	1631	68	2510	1054	2283	1260	2569	1499	117	4345	1094	2321	1267	2576	1558
13	450	997	2257	1282	2624	1589	69	2547	1096	2299	1352	2651	1585	118	4383	1074	2267	1331	2690	1565
14	487	1016	2294	1313	2659	1588	70	2585	1080	2351	1360	2615	1563	119	4420	1083	2293	1185	2556	1645
15	524	1035	2253	1235	2572	1586	71	2622	1036	2342	1439	2671	1535	120	4458	1086	2292	1245	2547	1512
16	562	1043	2268	1296	2635	1574	72	2660	1088	2269	1323	2619	1577	121	4495	1030	2284	1286	2669	1558
17	599	1050	2234	1296	2646	1585	73	2697	1063	2365	1231	2537	1566	122	4533	1030	2205	1519	2664	1621
20	712	1058	2305	1320	2704	1555	74	2735	1108	2356	1224	2554	1591	125	4645	1100	2323	1305	2631	1597
21	749	1024	2259	1238	2670	1495	75	2772	1084	2275	1309	2606	1474	126	4683	1097	2397	1259	2480	1554
22	787	1026	2279	1388	2674	1574	76	2810	1010	2341	1349	2583	1588	128	4757	1032	2249	1142	2527	1519
23	824	1035	2398	1265	2638	1524	81	2997	1063	2242	1398	2581	1591	129	4795	1040	2324	1239	2382	1597
24	862	1017	2144	1273	2653	1475	82	3034	1070	2278	1294	2651	1569	130	4832	1077	2321	1208	2560	1556
25	899	1120	2259	1358	2676	1542	83	3072	1108	2294	1277	2641	1581	131	4870	1044	2285	1309	2628	1535
26	937	1040	2332	1296	2640	1577	84	3109	1104	2418	1352	2689	1557	132	4907	1021	2342	1303	2641	1572
27	974	1071	2271	1386	2608	1552	85	3147	1040	2331	1349	2618	1567	133	4945	1060	2291	1289	2523	1530
31	1124	1092	2326	1346	2623	1563	86	3184	1032	2312	1338	2601	1610	134	4982	1026	2349	1313	2617	1553
32	1161	1037	2254	1300	2742	1611	87	3222	1013	2371	1338	2670	1564	135	5020	992	2299	1288	2659	1553
33	1199	975	2315	1297	2710	1551	88	3259	1121	2354	1241	2567	1607	136	5057	1088	2261	1283	2583	1583
34	1236	1025	2271	1362	2740	1547	89	3296	1050	2350	1333	2561	1583	137	5095	1091	2361	1339	2557	1550
35	1274	1048	2177	1334	2601	1556	90	3334	1054	2319	1245	2612	1554	138	5132	1051	2375	1338	2576	1523
36	1311	1036	2327	1369	2694	1472	91	3371	1145	2340	1294	2566	1594	140	5207	1069	2332	1362	2561	1554
37	1349	1035	2240	1361	2675	1566	92	3409	1094	2340	1245	2674	1582	141	5244	1039	2278	1338	2689	1527
38	1386	1035	2251	1276	2681	1593	93	3446	1082	2312	1205	2523	1516	142	5282	1070	2363	1334	2604	1567
40	1461	1071	2303	1292	2627	1569	94	3484	1044	2299	1245	2662	1524	143	5319	1048	2256	1324	2594	1520
41	1498	1095	2278	1320	2602	1614	95	3521	1040	2324	1269	2576	1598	144	5357	1047	2313	1383	2565	1506
42	1536	1035	2334	1166	2425	1575	96	3559	1075	2363	1279	2746	1475	146	5432	1097	2306	1245	2487	1514
43	1573	993	2241	1315	2752	1598	97	3596	1047	2326	1342	2631	1536	147	5469	1055	2190	1193	2530	1579
45	1648	1058	2308	1314	2511	1562	98	3634	1038	2288	1379	2732	1634	148	5507	1076	2284	1351	2635	1570
46	1686	1067	2328	1245	2633	1521	99	3671	1009	2328	1340	2617	1577	149	5544	983	2310	1400	2593	1495
47	1723	1086	2562	1259	2666	1610	100	3709	1058	2338	1338	2655	1547	150	5582	1106	2465	1235	2536	1539
50	1836	1009	2294	1444	2590	1655	101	3746	1091	2279	1241	2604	1536							
51	1873	1004	2312	1351	2624	1544	102	3783	1090	2271	1362	2505	1559							
52	1910	1067	2328	1376	2587	1501	103	3821	1042	2281	1342	2566	1646							
53	1948	1063	2259	1335	2595	1534	104	3858	1116	2326	1371	2567	1553							
54	1985	1011	2316	1368	2627	1552	106	3933	1103	2287	1254	2701	1540							
55	2023	1043	2345	1274	2611	1527	107	3971	1037	2307	1333	2710	1644							

Table 3.14a: Composition of Garnet I from sample 282 as analyzed along traverse C-D (Plate 6.8). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	33.51	4.49	3.51	0.69	21.35	38.32	0.04	101.86	2.19	0.52	0.29	0.05	1.97	3.00	0.00	8.02	0.72	0.17	0.10	0.02	0.81	0.19
2	34	31.62	4.98	3.70	0.71	21.29	38.14	0.00	100.46	2.08	0.59	0.31	0.05	1.98	3.00	0.00	8.01	0.69	0.19	0.10	0.02	0.78	0.22
3	68	31.57	5.32	3.80	0.59	21.74	38.87	0.00	101.90	2.04	0.61	0.31	0.04	1.98	3.01	0.00	8.00	0.68	0.20	0.10	0.01	0.77	0.23
4	103	31.20	5.78	3.88	0.70	21.88	38.24	0.02	101.66	2.02	0.67	0.32	0.05	2.00	2.97	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
5	137	31.58	5.60	3.87	0.57	21.55	38.42	0.00	101.58	2.05	0.65	0.32	0.04	1.98	2.99	0.00	8.02	0.67	0.21	0.11	0.01	0.76	0.24
6	171	30.76	5.88	3.77	0.75	21.55	38.35	0.00	101.06	2.01	0.68	0.32	0.05	1.98	2.99	0.00	8.02	0.66	0.22	0.10	0.02	0.75	0.25
7	205	31.27	5.95	3.68	0.75	21.60	38.60	0.00	101.84	2.02	0.69	0.31	0.05	1.97	2.99	0.00	8.03	0.66	0.22	0.10	0.02	0.75	0.25
8	239	31.64	5.72	3.54	0.66	21.53	38.56	0.07	101.66	2.05	0.66	0.29	0.04	1.97	2.99	0.00	8.02	0.67	0.22	0.10	0.01	0.76	0.24
9	274	31.65	5.97	3.53	0.66	21.60	38.24	0.07	101.64	2.06	0.69	0.29	0.04	1.98	2.97	0.00	8.04	0.67	0.22	0.10	0.01	0.75	0.25
10	308	31.19	6.02	3.58	0.81	21.53	38.68	0.23	101.80	2.02	0.69	0.30	0.05	1.96	2.99	0.01	8.02	0.66	0.23	0.10	0.02	0.74	0.26
12	376	30.83	5.97	3.53	0.55	21.43	38.50	0.27	101.10	2.01	0.69	0.29	0.04	1.97	3.00	0.02	8.01	0.66	0.23	0.10	0.01	0.74	0.26
13	411	30.58	5.96	3.56	0.63	21.47	38.24	0.03	100.44	2.00	0.70	0.30	0.04	1.98	2.99	0.00	8.01	0.66	0.23	0.10	0.01	0.74	0.26
14	445	30.80	6.01	3.64	0.69	21.76	38.89	0.11	101.80	1.99	0.69	0.30	0.05	1.98	3.00	0.01	8.01	0.66	0.23	0.10	0.01	0.74	0.26
15	479	31.00	6.16	3.59	0.62	21.37	38.14	0.13	100.88	2.03	0.72	0.30	0.04	1.97	2.98	0.01	8.04	0.66	0.23	0.10	0.01	0.74	0.26
17	547	30.93	6.28	3.44	0.60	21.54	38.36	0.00	101.16	2.01	0.73	0.29	0.04	1.98	2.98	0.00	8.03	0.66	0.24	0.09	0.01	0.73	0.27
18	582	31.07	5.96	3.49	0.61	21.61	38.52	0.00	101.26	2.02	0.69	0.29	0.04	1.98	2.99	0.00	8.02	0.66	0.23	0.10	0.01	0.75	0.25
19	616	30.61	6.23	3.59	0.64	21.47	38.47	0.11	101.02	1.99	0.72	0.30	0.04	1.97	2.99	0.01	8.02	0.65	0.24	0.10	0.01	0.73	0.27
20	650	30.86	6.22	3.62	0.62	21.51	38.29	0.20	101.14	2.01	0.72	0.30	0.04	1.97	2.98	0.01	8.03	0.65	0.23	0.10	0.01	0.74	0.26
21	684	31.19	6.06	3.53	0.74	21.35	38.29	0.02	101.16	2.03	0.70	0.29	0.05	1.96	2.99	0.00	8.03	0.66	0.23	0.10	0.02	0.74	0.26
22	718	30.94	6.13	3.65	0.61	21.59	38.70	0.00	101.62	2.00	0.71	0.30	0.04	1.97	3.00	0.00	8.02	0.66	0.23	0.10	0.01	0.74	0.26
23	753	30.77	6.33	3.70	0.78	21.82	38.71	0.04	102.12	1.98	0.73	0.31	0.05	1.98	2.98	0.00	8.03	0.65	0.24	0.10	0.02	0.73	0.27
24	787	30.60	6.34	3.62	0.52	21.14	38.26	0.11	100.48	2.00	0.74	0.30	0.03	1.95	3.00	0.01	8.03	0.65	0.24	0.10	0.01	0.73	0.27
25	821	30.98	6.11	3.61	0.69	21.37	38.38	0.06	101.14	2.02	0.71	0.30	0.05	1.96	2.99	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
26	855	31.07	6.33	3.61	0.60	21.32	38.39	0.08	101.32	2.02	0.73	0.30	0.04	1.95	2.99	0.00	8.04	0.65	0.24	0.10	0.01	0.73	0.27
27	889	31.16	6.06	3.50	0.62	21.24	37.83	0.01	100.42	2.05	0.71	0.30	0.04	1.97	2.98	0.00	8.04	0.66	0.23	0.10	0.01	0.74	0.26
29	958	31.56	6.05	3.64	0.66	21.48	38.83	0.01	102.22	2.04	0.70	0.30	0.04	1.95	3.00	0.00	8.03	0.66	0.23	0.10	0.01	0.75	0.25
30	992	31.08	5.97	3.51	0.69	21.28	38.40	0.01	100.92	2.03	0.70	0.29	0.05	1.96	3.00	0.00	8.02	0.66	0.23	0.10	0.01	0.74	0.26
31	1026	31.59	5.76	3.73	0.71	21.80	38.53	0.15	102.12	2.04	0.66	0.31	0.05	1.99	2.98	0.01	8.03	0.67	0.22	0.10	0.02	0.75	0.25
33	1095	31.85	5.56	3.45	0.53	21.62	38.23	0.00	101.24	2.08	0.65	0.29	0.04	1.99	2.98	0.00	8.02	0.68	0.21	0.09	0.01	0.76	0.24
34	1129	31.43	5.99	3.45	0.73	21.36	38.17	0.02	101.12	2.05	0.70	0.29	0.05	1.97	2.98	0.00	8.04	0.66	0.23	0.09	0.02	0.75	0.25

35	1163	31.26	5.96	3.58	0.79	21.70	38.48	0.01	101.78	2.03	0.69	0.30	0.05	1.98	2.98	0.00	8.03	0.66	0.22	0.10	0.02	0.75	0.25
36	1197	31.32	5.81	3.44	0.63	21.00	38.22	0.14	100.42	2.06	0.68	0.29	0.04	1.95	3.00	0.01	8.02	0.67	0.22	0.09	0.01	0.75	0.25
37	1232	31.36	5.99	3.47	0.77	21.73	38.43	0.00	101.74	2.03	0.69	0.29	0.05	1.99	2.98	0.00	8.03	0.66	0.23	0.09	0.02	0.75	0.25
38	1266	31.26	5.70	3.46	0.67	21.20	37.76	0.00	100.06	2.07	0.67	0.29	0.05	1.97	2.98	0.00	8.03	0.67	0.22	0.10	0.01	0.75	0.25
39	1300	31.63	5.77	3.50	0.68	21.53	38.40	0.00	101.52	2.06	0.67	0.29	0.05	1.97	2.99	0.00	8.03	0.67	0.22	0.10	0.01	0.75	0.25
40	1334	31.87	5.72	3.41	0.78	21.75	38.59	0.00	102.12	2.06	0.66	0.28	0.05	1.98	2.99	0.00	8.02	0.67	0.22	0.09	0.02	0.76	0.24
41	1368	31.85	5.28	3.29	0.81	21.22	38.07	0.09	100.54	2.10	0.62	0.28	0.05	1.97	3.00	0.01	8.02	0.69	0.20	0.09	0.02	0.77	0.23
42	1403	32.02	5.02	3.15	0.70	21.64	38.08	0.00	100.60	2.11	0.59	0.27	0.05	2.01	2.99	0.00	8.00	0.70	0.20	0.09	0.02	0.78	0.22
43	1437	32.48	5.47	3.32	0.75	21.42	38.08	0.07	101.52	2.12	0.64	0.28	0.05	1.97	2.98	0.00	8.04	0.69	0.21	0.09	0.02	0.77	0.23
44	1471	32.26	5.50	3.39	1.01	21.23	37.92	0.06	101.32	2.12	0.64	0.29	0.07	1.96	2.97	0.00	8.05	0.68	0.21	0.09	0.02	0.77	0.23
45	1505	32.01	5.63	3.33	0.66	21.18	38.45	0.07	101.24	2.09	0.66	0.28	0.04	1.95	3.00	0.00	8.02	0.68	0.21	0.09	0.01	0.76	0.24
46	1539	32.41	5.68	3.31	0.84	21.56	38.48	0.01	102.28	2.10	0.66	0.27	0.05	1.97	2.98	0.00	8.03	0.68	0.21	0.09	0.02	0.76	0.24
47	1574	31.89	5.74	3.35	0.78	21.56	38.44	0.00	101.76	2.07	0.67	0.28	0.05	1.97	2.99	0.00	8.03	0.68	0.22	0.09	0.02	0.76	0.24
48	1608	30.34	5.56	3.17	0.62	20.79	36.60	0.01	97.08	2.06	0.67	0.28	0.04	1.99	2.98	0.00	8.03	0.68	0.22	0.09	0.01	0.75	0.25
52	1745	31.61	5.81	3.39	0.61	21.27	38.44	0.00	101.14	2.06	0.68	0.28	0.04	1.96	3.00	0.00	8.02	0.67	0.22	0.09	0.01	0.75	0.25
53	1779	31.39	6.07	3.28	0.77	21.30	38.67	0.00	101.48	2.04	0.70	0.27	0.05	1.95	3.00	0.00	8.02	0.67	0.23	0.09	0.02	0.74	0.26
54	1813	31.06	6.00	3.55	0.84	21.22	38.12	0.00	100.80	2.03	0.70	0.30	0.06	1.96	2.99	0.00	8.03	0.66	0.23	0.10	0.02	0.74	0.26
55	1847	31.11	6.10	3.43	0.60	21.73	38.10	0.03	101.06	2.03	0.71	0.29	0.04	2.00	2.97	0.00	8.03	0.66	0.23	0.09	0.01	0.74	0.26
59	1984	30.73	5.93	3.48	0.65	21.41	38.77	0.07	100.96	2.00	0.69	0.29	0.04	1.96	3.02	0.00	8.00	0.66	0.23	0.10	0.01	0.74	0.26
60	2018	31.15	6.24	3.51	0.60	21.55	38.70	0.00	101.74	2.02	0.72	0.29	0.04	1.96	2.99	0.00	8.02	0.66	0.23	0.09	0.01	0.74	0.26
61	2053	30.55	5.86	3.73	0.57	21.41	38.60	0.18	100.74	1.99	0.68	0.31	0.04	1.97	3.01	0.01	8.00	0.66	0.23	0.10	0.01	0.75	0.25
64	2155	31.24	6.02	3.73	0.77	21.23	38.70	0.12	101.68	2.03	0.70	0.31	0.05	1.94	3.00	0.01	8.03	0.66	0.23	0.10	0.02	0.74	0.26
65	2189	30.62	5.95	3.71	0.78	21.67	38.63	0.00	101.36	1.99	0.69	0.31	0.05	1.98	3.00	0.00	8.01	0.65	0.23	0.10	0.02	0.74	0.26
66	2224	30.53	6.13	3.91	0.62	21.82	38.48	0.04	101.50	1.98	0.71	0.32	0.04	1.99	2.98	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
68	2292	30.54	5.99	4.00	0.74	21.69	38.47	0.04	101.42	1.98	0.69	0.33	0.05	1.98	2.98	0.00	8.02	0.65	0.23	0.11	0.02	0.74	0.26
69	2326	30.93	5.94	3.85	0.43	21.08	38.37	0.00	100.60	2.03	0.69	0.32	0.03	1.95	3.01	0.00	8.02	0.66	0.23	0.11	0.01	0.75	0.25
70	2360	30.76	5.90	3.94	0.58	21.47	38.57	0.00	101.22	2.00	0.68	0.33	0.04	1.97	3.00	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
74	2497	30.91	5.90	3.86	0.56	21.47	38.70	0.05	101.40	2.01	0.68	0.32	0.04	1.96	3.00	0.00	8.01	0.66	0.22	0.11	0.01	0.75	0.25
75	2532	31.47	5.85	3.93	0.57	21.41	38.25	0.00	101.48	2.05	0.68	0.33	0.04	1.97	2.98	0.00	8.04	0.66	0.22	0.11	0.01	0.75	0.25
76	2566	31.16	5.89	3.96	0.73	21.29	38.57	0.13	101.58	2.02	0.68	0.33	0.05	1.95	3.00	0.01	8.03	0.66	0.22	0.11	0.02	0.75	0.25
77	2600	30.52	5.79	4.21	0.59	21.61	38.67	0.10	101.38	1.98	0.67	0.35	0.04	1.98	3.00	0.01	8.01	0.65	0.22	0.12	0.01	0.75	0.25
78	2634	30.82	5.70	4.16	0.71	21.32	38.35	0.00	101.06	2.01	0.66	0.35	0.05	1.96	2.99	0.00	8.03	0.66	0.22	0.11	0.02	0.75	0.25
79	2668	30.75	5.72	4.18	0.65	21.14	38.33	0.07	100.78	2.01	0.67	0.35	0.04	1.95	3.00	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
80	2703	31.02	5.74	4.19	0.61	21.32	38.50	0.07	101.38	2.02	0.67	0.35	0.04	1.96	3.00	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
81	2737	31.65	5.10	4.37	0.80	21.27	38.11	0.00	101.30	2.07	0.59	0.37	0.05	1.96	2.98	0.00	8.03	0.67	0.19	0.12	0.02	0.78	0.22

83	2805	30.87	5.94	4.20	0.66	21.40	38.50	0.00	101.58	2.00	0.69	0.35	0.04	1.96	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.74	0.26
84	2839	30.63	5.81	4.12	0.76	21.29	38.74	0.15	101.34	1.99	0.67	0.34	0.05	1.95	3.01	0.01	8.02	0.65	0.22	0.11	0.02	0.75	0.25
86	2908	31.00	5.72	4.08	0.74	21.56	38.84	0.20	101.94	2.00	0.66	0.34	0.05	1.96	3.00	0.01	8.02	0.66	0.22	0.11	0.02	0.75	0.25
87	2942	30.78	5.74	4.40	0.63	21.44	38.31	0.00	101.30	2.01	0.67	0.37	0.04	1.97	2.98	0.00	8.03	0.65	0.22	0.12	0.01	0.75	0.25
88	2976	31.12	5.75	4.29	0.73	21.16	38.37	0.14	101.42	2.03	0.67	0.36	0.05	1.94	2.99	0.01	8.04	0.65	0.22	0.12	0.02	0.75	0.25
89	3010	30.02	5.73	4.30	0.73	21.33	37.91	0.04	100.02	1.98	0.67	0.36	0.05	1.98	2.98	0.00	8.03	0.65	0.22	0.12	0.02	0.75	0.25
90	3045	30.68	5.72	4.21	0.61	21.46	38.59	0.00	101.26	1.99	0.66	0.35	0.04	1.97	3.00	0.00	8.02	0.65	0.22	0.12	0.01	0.75	0.25
91	3079	30.79	5.92	4.21	0.70	21.36	38.23	0.03	101.20	2.01	0.69	0.35	0.05	1.96	2.98	0.00	8.04	0.65	0.22	0.11	0.01	0.74	0.26
92	3113	30.50	5.68	4.28	0.69	21.46	38.54	0.03	101.14	1.99	0.66	0.36	0.05	1.97	3.00	0.00	8.02	0.65	0.22	0.12	0.01	0.75	0.25
93	3147	30.99	5.70	4.14	0.66	21.20	38.44	0.06	101.12	2.02	0.66	0.35	0.04	1.95	3.00	0.00	8.03	0.66	0.22	0.11	0.01	0.75	0.25
94	3182	31.47	5.45	4.09	0.90	21.16	38.39	0.00	101.46	2.05	0.63	0.34	0.06	1.95	3.00	0.00	8.03	0.67	0.21	0.11	0.02	0.76	0.24
96	3250	30.79	6.05	4.23	0.66	21.21	38.45	0.00	101.40	2.00	0.70	0.35	0.04	1.94	2.99	0.00	8.04	0.65	0.23	0.11	0.01	0.74	0.26
98	3318	30.79	6.09	4.23	0.70	21.44	39.11	0.04	102.36	1.98	0.70	0.35	0.05	1.94	3.01	0.00	8.02	0.64	0.23	0.11	0.01	0.74	0.26
99	3353	30.77	5.87	4.22	0.57	21.42	38.04	0.14	100.90	2.01	0.68	0.35	0.04	1.97	2.97	0.01	8.04	0.65	0.22	0.11	0.01	0.75	0.25
100	3387	30.55	5.62	4.14	0.58	21.09	38.24	0.07	100.22	2.01	0.66	0.35	0.04	1.95	3.01	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
101	3421	30.88	5.86	4.18	0.63	21.35	38.29	0.09	101.20	2.01	0.68	0.35	0.04	1.96	2.99	0.01	8.03	0.65	0.22	0.11	0.01	0.75	0.25
102	3455	30.66	5.87	4.10	0.74	21.49	38.27	0.00	101.12	2.00	0.68	0.34	0.05	1.97	2.98	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
104	3524	30.69	5.72	4.07	0.66	21.53	38.57	0.00	101.24	2.00	0.66	0.34	0.04	1.97	3.00	0.00	8.01	0.66	0.22	0.11	0.01	0.75	0.25
107	3626	30.61	6.06	4.01	0.57	21.25	38.30	0.00	100.80	2.00	0.71	0.34	0.04	1.96	2.99	0.00	8.03	0.65	0.23	0.11	0.01	0.74	0.26
108	3660	30.59	5.87	4.01	0.53	21.25	38.43	0.05	100.68	2.00	0.68	0.34	0.04	1.96	3.00	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
109	3695	30.96	5.99	3.96	0.67	21.11	38.11	0.18	100.80	2.03	0.70	0.33	0.04	1.95	2.99	0.01	8.04	0.65	0.23	0.11	0.01	0.74	0.26
110	3729	30.50	5.90	3.94	0.64	21.02	38.18	0.00	100.18	2.01	0.69	0.33	0.04	1.95	3.00	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
111	3763	30.90	5.93	3.92	0.80	21.24	38.48	0.00	101.28	2.01	0.69	0.33	0.05	1.95	3.00	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
112	3797	31.28	5.97	3.94	0.62	21.29	38.17	0.03	101.28	2.04	0.69	0.33	0.04	1.96	2.98	0.00	8.04	0.66	0.22	0.11	0.01	0.75	0.25
113	3832	30.72	6.07	4.05	0.72	21.22	38.30	0.05	101.08	2.00	0.71	0.34	0.05	1.95	2.99	0.00	8.04	0.65	0.23	0.11	0.02	0.74	0.26
114	3866	30.77	5.91	3.93	0.73	21.40	38.37	0.13	101.10	2.01	0.69	0.33	0.05	1.97	2.99	0.01	8.03	0.65	0.22	0.11	0.02	0.75	0.25
115	3900	30.67	5.91	3.94	0.57	21.59	38.57	0.00	101.24	1.99	0.68	0.33	0.04	1.98	3.00	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
116	3934	30.65	5.90	3.84	0.56	21.63	38.15	0.00	100.72	2.00	0.69	0.32	0.04	1.99	2.98	0.00	8.02	0.66	0.23	0.11	0.01	0.74	0.26
117	3968	31.20	5.99	3.90	0.61	21.60	38.64	0.14	101.92	2.02	0.69	0.32	0.04	1.97	2.99	0.01	8.03	0.66	0.22	0.11	0.01	0.75	0.25
118	4003	30.93	5.86	3.77	0.56	21.58	38.14	0.03	100.84	2.02	0.68	0.32	0.04	1.99	2.98	0.00	8.03	0.66	0.22	0.10	0.01	0.75	0.25
119	4037	30.34	5.72	3.73	0.56	21.31	38.66	0.00	100.32	1.99	0.67	0.31	0.04	1.96	3.03	0.00	7.99	0.66	0.22	0.10	0.01	0.75	0.25
120	4071	31.05	6.00	3.97	0.76	21.35	38.53	0.04	101.66	2.02	0.69	0.33	0.05	1.95	2.99	0.00	8.03	0.65	0.22	0.11	0.02	0.74	0.26
121	4105	30.69	6.01	3.67	0.59	21.46	38.31	0.11	100.74	2.00	0.70	0.31	0.04	1.98	2.99	0.01	8.02	0.66	0.23	0.10	0.01	0.74	0.26
122	4139	30.87	5.70	3.67	0.60	21.02	37.86	0.00	99.72	2.04	0.67	0.31	0.04	1.96	3.00	0.00	8.02	0.67	0.22	0.10	0.01	0.75	0.25
126	4276	31.37	5.94	3.65	0.44	21.42	38.62	0.03	101.42	2.04	0.69	0.30	0.03	1.96	3.00	0.00	8.02	0.67	0.22	0.10	0.01	0.75	0.25

127	4310	31.25	6.15	3.43	0.64	21.77	38.75	0.06	102.00	2.02	0.71	0.28	0.04	1.98	2.99	0.00	8.02	0.66	0.23	0.09	0.01	0.74	0.26
128	4345	31.48	6.05	3.55	0.53	21.39	38.22	0.04	101.22	2.05	0.70	0.30	0.04	1.97	2.98	0.00	8.04	0.66	0.23	0.10	0.01	0.74	0.26
129	4379	31.26	5.87	3.53	0.58	21.30	38.95	0.06	101.50	2.03	0.68	0.29	0.04	1.95	3.02	0.00	8.01	0.67	0.22	0.10	0.01	0.75	0.25
130	4413	31.35	6.00	3.52	0.84	21.22	38.58	0.10	101.50	2.04	0.70	0.29	0.06	1.95	3.00	0.01	8.03	0.66	0.23	0.10	0.02	0.75	0.25
131	4447	31.18	5.98	3.63	0.68	21.19	38.43	0.00	101.08	2.04	0.70	0.30	0.05	1.95	3.00	0.00	8.03	0.66	0.23	0.10	0.01	0.75	0.25
132	4482	31.30	5.71	3.43	0.56	21.33	38.40	0.09	100.74	2.05	0.67	0.29	0.04	1.97	3.00	0.01	8.01	0.67	0.22	0.09	0.01	0.75	0.25
133	4516	31.97	5.76	3.40	0.70	21.25	38.37	0.00	101.44	2.09	0.67	0.28	0.05	1.95	2.99	0.00	8.03	0.68	0.22	0.09	0.01	0.76	0.24
134	4550	31.54	5.70	3.25	0.66	21.57	38.15	0.00	100.86	2.06	0.66	0.27	0.04	1.99	2.99	0.00	8.02	0.68	0.22	0.09	0.01	0.76	0.24
136	4618	32.39	5.22	3.26	0.66	21.57	38.31	0.00	101.42	2.11	0.61	0.27	0.04	1.99	2.99	0.00	8.02	0.70	0.20	0.09	0.01	0.78	0.22
137	4653	32.03	5.41	3.42	0.81	21.40	38.16	0.00	101.22	2.10	0.63	0.29	0.05	1.97	2.99	0.00	8.03	0.68	0.21	0.09	0.02	0.77	0.23
138	4687	33.13	5.03	3.45	0.76	21.77	38.29	0.02	102.42	2.15	0.58	0.29	0.05	1.99	2.97	0.00	8.03	0.70	0.19	0.09	0.02	0.79	0.21
139	4721	31.89	5.59	3.38	0.76	21.21	38.01	0.08	100.84	2.09	0.65	0.28	0.05	1.96	2.99	0.00	8.03	0.68	0.21	0.09	0.02	0.76	0.24
140	4755	32.36	5.27	3.19	0.76	21.37	38.64	0.00	101.58	2.11	0.61	0.27	0.05	1.96	3.01	0.00	8.01	0.69	0.20	0.09	0.02	0.78	0.22
141	4789	32.37	5.44	3.47	0.73	21.30	38.25	0.08	101.56	2.11	0.63	0.29	0.05	1.96	2.99	0.00	8.03	0.69	0.21	0.09	0.02	0.77	0.23
142	4824	31.71	5.64	3.24	0.80	21.54	37.92	0.00	100.86	2.08	0.66	0.27	0.05	1.99	2.97	0.00	8.03	0.68	0.22	0.09	0.02	0.76	0.24
143	4858	32.12	5.42	3.47	0.76	21.34	38.51	0.00	101.60	2.09	0.63	0.29	0.05	1.96	3.00	0.00	8.02	0.68	0.21	0.09	0.02	0.77	0.23
144	4892	32.34	5.49	3.44	0.64	21.67	38.52	0.00	102.10	2.10	0.63	0.29	0.04	1.98	2.99	0.00	8.02	0.69	0.21	0.09	0.01	0.77	0.23
145	4926	31.75	5.69	3.37	0.95	21.82	38.54	0.00	102.12	2.05	0.66	0.28	0.06	1.99	2.98	0.00	8.02	0.67	0.21	0.09	0.02	0.76	0.24
146	4960	32.22	5.12	3.23	0.72	21.35	38.21	0.03	100.86	2.12	0.60	0.27	0.05	1.98	3.00	0.00	8.01	0.70	0.20	0.09	0.02	0.78	0.22
147	4995	32.33	4.91	3.55	0.72	21.41	38.08	0.17	101.00	2.12	0.58	0.30	0.05	1.98	2.99	0.01	8.02	0.70	0.19	0.10	0.02	0.79	0.21
148	5029	33.04	5.12	3.41	0.65	21.58	38.11	0.05	101.92	2.16	0.60	0.29	0.04	1.98	2.97	0.00	8.04	0.70	0.19	0.09	0.01	0.78	0.22
149	5063	32.89	5.02	3.37	0.86	21.53	38.59	0.06	102.26	2.14	0.58	0.28	0.06	1.97	3.00	0.00	8.02	0.70	0.19	0.09	0.02	0.79	0.21

Table 3.14.b: Qualitative trace element analyses of Garnet I from sample 282 along traverse C-D (Plate 6.8). Relative concentrations are measured in counts\second. **D** = distance from starting point C in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1287	2672	1626	1116	2222	47	1574	1156	2765	1589	1064	2334	104	3524	1664	2664	1603	1027	2342
2	34	1218	2627	1569	1046	2327	48	1608	1265	2772	1548	1043	2265	111	3763	1368	2730	1561	1095	2346
3	68	1268	2654	1623	1116	2409	49	1642	1238	2678	1537	998	2250	112	3797	1317	2530	1582	1108	2250
4	103	1236	2660	1559	1077	2306	50	1676	1261	2629	1541	1128	2215	113	3832	1211	2543	1444	1016	2248
5	137	1245	2613	1562	1010	2330	51	1711	1186	2580	1610	1072	2215	115	3900	1680	2591	1582	1081	2206
6	171	1250	2557	1613	1048	2344	55	1847	1177	2585	1520	1019	2207	116	3934	1590	2610	1575	1052	2280
7	205	1186	2599	1502	980	2345	56	1882	1219	2583	1580	1002	2178	117	3968	1382	2637	1535	1073	2244
8	239	1229	2621	1556	1077	2246	57	1916	1235	2658	1571	1064	2174	118	4003	1374	2633	1552	1103	2274
9	274	1221	2585	1542	1094	2380	58	1950	1296	2649	1535	1064	2255	119	4037	1327	2711	1630	1105	2377
10	308	1249	2574	1540	1013	2272	59	1984	1160	2494	1511	1004	2222	120	4071	1195	2617	1555	1067	2330
11	342	1224	2679	1542	1048	2341	62	2087	1191	2692	1613	1062	2217	122	4139	1166	2570	1549	1062	2218
12	376	1243	2647	1513	1051	2296	63	2121	1197	2512	1494	1051	2253	125	4242	1252	2643	1552	1032	2217
13	411	1279	2688	1504	1039	2274	64	2155	1308	2535	1561	1033	2254	126	4276	1268	2699	1561	1034	2284
14	445	1244	2703	1582	1068	2232	67	2258	1343	2674	1610	1096	2281	127	4310	1229	2595	1593	1040	2399
15	479	1197	2650	1583	1021	2291	68	2292	1337	2613	1537	1027	2185	130	4413	1263	2711	1636	1037	2399
16	513	1282	2548	1551	1042	2288	69	2326	1146	2549	1534	985	2231	131	4447	1212	2653	1570	1061	2261
17	547	1239	2684	1545	1042	2259	70	2360	1051	2360	1329	932	2047	132	4482	1216	2562	1484	1052	2329
18	582	1399	2622	1574	1056	2352	71	2395	1177	2495	1574	1022	2295	133	4516	1344	2736	1637	1050	2161
20	650	1306	2524	1591	1065	2265	72	2429	1244	2726	1573	1090	2346	134	4550	1407	2664	1669	1029	2261
21	684	1235	2697	1586	1045	2201	73	2463	1297	2744	1500	1083	2210	135	4584	1326	2660	1515	1016	2145
22	718	1162	2632	1585	1055	2197	77	2600	1325	2675	1552	1014	2277	136	4618	1309	2875	1594	1019	2214
23	753	1270	2686	1527	1051	2278	78	2634	1304	2652	1574	1014	2281	137	4653	1161	2620	1603	990	2217
24	787	1170	2685	1568	1055	2402	79	2668	1357	2674	1582	1054	2318	138	4687	1208	2649	1550	1095	2270
25	821	1373	2566	1551	1023	2189	80	2703	1338	2579	1625	1112	2237	139	4721	1271	2616	1606	1046	2340
26	855	1397	2549	1585	1077	2341	81	2737	1325	2533	1580	1120	2289	140	4755	1183	2731	1571	1034	2255
27	889	1212	2546	1532	1068	2220	82	2771	1328	2700	1585	1020	2336	141	4789	1174	2665	1603	1062	2198
28	924	1168	2524	1633	1059	2352	83	2805	1258	2572	1589	1107	2342	142	4824	1165	2788	1619	1118	2318
29	958	1170	2579	1521	1068	2192	84	2839	1204	2650	1477	1115	2387	143	4858	1192	2679	1610	1082	2289
30	992	1215	2598	1568	1035	2289	86	2908	1289	2706	1527	1058	2295	144	4892	1207	2664	1516	1028	2232
31	1026	1262	2689	1552	1092	2267	87	2942	1318	2582	1407	1029	2161	145	4926	1230	2787	1567	1073	2315
32	1061	1249	2718	1513	1094	2235	88	2976	1292	2669	1553	1049	2269	146	4960	1237	2844	1494	1063	2256
33	1095	1194	2663	1606	1075	2266	89	3010	1276	2688	1506	1022	2278	147	4995	1237	2779	1533	1032	2254
35	1163	1224	2760	1685	1105	2399	90	3045	1309	2641	1537	1041	2360	148	5029	1271	2811	1562	1041	2332
36	1197	1162	2645	1542	1088	2292	91	3079	1338	2568	1511	1047	2275	149	5063	1248	2614	1560	1107	2254
37	1232	1184	2707	1604	1046	2245	92	3113	1367	2525	1556	1053	2325	150	5097	1237	2698	1538	1027	2194
38	1266	1212	2642	1569	997	2284	93	3147	1288	2608	1535	1010	2397							
39	1300	1308	2518	1563	1086	2262	94	3182	1343	2688	1528	1024	2402							
40	1334	1173	2497	1553	1038	2455	95	3216	1255	2732	1561	1072	2257							
41	1368	1203	2626	1511	1046	2203	96	3250	1322	2614	1516	1073	2346							
42	1403	1229	2697	1575	1052	2267	97	3284	1326	2613	1582	1094	2324							
43	1437	1273	2767	1567	1031	2172	98	3318	1504	2652	1563	1093	2317							
44	1471	1278	2836	1484	1035	2252	100	3387	1644	2623	1540	1030	2329							
45	1505	1204	2657	1568	1067	2282	102	3455	1801	2655	1540	1130	2264							
46	1539	1291	2292	1484	935	2354	103	3489	1413	2654	1548	1044	2244							

Table 3.15a: Composition of Garnet II from sample 282 as analyzed along traverse A-B (Plate 6.9). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
2	38	32.22	5.15	3.30	0.70	21.63	38.77	0.10	101.78	2.09	0.60	0.27	0.05	1.98	3.01	0.01	8.00	0.70	0.20	0.09	0.02	0.78	0.22
3	77	31.08	5.58	3.49	0.91	21.76	38.17	0.00	101.00	2.03	0.65	0.29	0.06	2.00	2.98	0.00	8.02	0.67	0.21	0.10	0.02	0.76	0.24
4	115	31.58	5.73	3.37	0.76	21.34	37.97	0.00	100.74	2.07	0.67	0.28	0.05	1.97	2.98	0.00	8.03	0.67	0.22	0.09	0.02	0.76	0.24
5	154	31.22	5.84	3.67	0.65	21.57	38.54	0.17	101.48	2.03	0.68	0.31	0.04	1.97	2.99	0.01	8.02	0.66	0.22	0.10	0.01	0.75	0.25
6	192	31.49	5.82	3.48	0.65	21.31	37.86	0.01	100.60	2.07	0.68	0.29	0.04	1.97	2.98	0.00	8.04	0.67	0.22	0.09	0.01	0.75	0.25
7	231	31.44	6.04	3.41	0.55	21.40	38.08	0.04	100.90	2.06	0.70	0.29	0.04	1.97	2.98	0.00	8.03	0.67	0.23	0.09	0.01	0.75	0.25
8	269	30.82	5.86	3.58	0.53	21.43	38.06	0.00	100.28	2.02	0.69	0.30	0.04	1.98	2.99	0.00	8.02	0.66	0.23	0.10	0.01	0.75	0.25
9	307	31.21	5.99	3.63	0.73	21.58	38.27	0.00	101.40	2.03	0.70	0.30	0.05	1.98	2.98	0.00	8.03	0.66	0.23	0.10	0.02	0.74	0.26
10	346	31.08	5.90	3.63	0.73	21.31	38.30	0.06	100.96	2.03	0.69	0.30	0.05	1.96	2.99	0.00	8.03	0.66	0.22	0.10	0.02	0.75	0.25
11	384	30.80	5.93	3.51	0.56	21.65	38.32	0.03	100.76	2.01	0.69	0.29	0.04	1.99	2.99	0.00	8.01	0.66	0.23	0.10	0.01	0.74	0.26
12	423	31.01	5.88	3.55	0.73	21.34	38.21	0.07	100.72	2.03	0.69	0.30	0.05	1.97	2.99	0.00	8.02	0.66	0.22	0.10	0.02	0.75	0.25
13	461	31.09	5.97	3.70	0.77	21.99	38.75	0.00	102.26	2.00	0.68	0.31	0.05	2.00	2.98	0.00	8.02	0.66	0.23	0.10	0.02	0.75	0.25
14	500	30.68	5.92	3.65	0.65	21.87	38.37	0.00	101.16	1.99	0.69	0.30	0.04	2.00	2.98	0.00	8.02	0.66	0.23	0.10	0.01	0.74	0.26
15	538	31.31	6.00	3.79	0.74	21.93	38.84	0.00	102.60	2.01	0.69	0.31	0.05	1.99	2.98	0.00	8.02	0.66	0.22	0.10	0.02	0.75	0.25
16	576	30.92	5.87	3.53	0.52	21.13	37.92	0.00	99.90	2.04	0.69	0.30	0.04	1.97	2.99	0.00	8.02	0.67	0.23	0.10	0.01	0.75	0.25
17	615	30.29	5.98	3.50	0.77	21.17	38.25	0.01	99.96	1.99	0.70	0.29	0.05	1.96	3.01	0.00	8.01	0.66	0.23	0.10	0.02	0.74	0.26
18	653	31.33	6.00	3.70	0.70	21.54	38.02	0.00	101.28	2.04	0.70	0.31	0.05	1.98	2.97	0.00	8.04	0.66	0.23	0.10	0.01	0.75	0.25
19	692	30.59	5.84	3.74	0.67	21.59	38.43	0.08	100.86	1.99	0.68	0.31	0.04	1.98	3.00	0.00	8.01	0.66	0.22	0.10	0.01	0.75	0.25
20	730	30.96	6.05	3.61	0.63	21.53	37.70	0.01	100.48	2.03	0.71	0.30	0.04	1.99	2.96	0.00	8.04	0.66	0.23	0.10	0.01	0.74	0.26
21	769	30.92	6.09	3.72	0.76	21.72	38.47	0.00	101.68	2.00	0.70	0.31	0.05	1.98	2.98	0.00	8.03	0.65	0.23	0.10	0.02	0.74	0.26
22	807	30.46	5.78	3.74	0.82	21.35	38.23	0.00	100.38	2.00	0.68	0.31	0.05	1.97	3.00	0.00	8.01	0.66	0.22	0.10	0.02	0.75	0.25
23	845	30.71	5.84	3.87	0.67	21.41	38.12	0.09	100.62	2.01	0.68	0.32	0.04	1.98	2.99	0.01	8.03	0.66	0.22	0.11	0.01	0.75	0.25
24	884	31.08	5.95	3.85	0.68	21.25	38.29	0.12	101.10	2.03	0.69	0.32	0.05	1.96	2.99	0.01	8.03	0.66	0.22	0.10	0.01	0.75	0.25
25	922	31.08	5.89	3.89	0.78	21.70	38.30	0.14	101.62	2.02	0.68	0.32	0.05	1.99	2.97	0.01	8.03	0.66	0.22	0.11	0.02	0.75	0.25
26	961	31.37	5.16	3.81	0.68	21.40	38.23	0.29	100.94	2.05	0.60	0.32	0.04	1.97	2.99	0.02	8.00	0.68	0.20	0.11	0.01	0.77	0.23
27	999	30.86	5.61	3.86	0.70	21.96	38.53	0.11	101.52	2.00	0.65	0.32	0.05	2.01	2.99	0.01	8.01	0.66	0.22	0.11	0.02	0.76	0.24
29	1076	30.67	5.66	3.79	0.53	21.06	38.00	0.00	99.72	2.03	0.67	0.32	0.04	1.96	3.00	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
30	1114	31.28	5.91	3.81	0.64	21.67	37.98	0.00	101.30	2.04	0.69	0.32	0.04	1.99	2.96	0.00	8.04	0.66	0.22	0.10	0.01	0.75	0.25

31	1153	30.98	5.99	3.94	0.62	21.88	38.64	0.00	102.06	2.00	0.69	0.33	0.04	1.99	2.98	0.00	8.02	0.65	0.23	0.11	0.01	0.74	0.26
32	1191	30.74	5.84	3.92	0.79	21.32	37.99	0.02	100.60	2.02	0.68	0.33	0.05	1.97	2.98	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
33	1230	30.72	5.85	3.95	0.79	21.67	38.14	0.00	101.12	2.00	0.68	0.33	0.05	1.99	2.97	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
34	1268	30.71	5.89	3.86	0.77	21.18	37.66	0.07	100.06	2.03	0.69	0.33	0.05	1.97	2.97	0.00	8.04	0.65	0.22	0.11	0.02	0.75	0.25
35	1307	30.75	5.91	4.04	0.69	21.15	38.13	0.07	100.68	2.02	0.69	0.34	0.05	1.95	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.74	0.26
36	1345	30.78	5.88	3.97	0.73	21.73	38.22	0.00	101.30	2.00	0.68	0.33	0.05	1.99	2.97	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
37	1383	30.56	5.78	4.12	0.64	21.43	38.12	0.06	100.64	2.00	0.67	0.35	0.04	1.98	2.99	0.00	8.03	0.65	0.22	0.11	0.01	0.75	0.25
38	1422	31.41	5.75	4.16	0.65	21.63	38.35	0.03	101.94	2.04	0.66	0.35	0.04	1.98	2.97	0.00	8.04	0.66	0.22	0.11	0.01	0.75	0.25
39	1460	30.48	5.39	4.20	0.78	21.33	38.07	0.00	100.26	2.01	0.63	0.35	0.05	1.98	2.99	0.00	8.02	0.66	0.21	0.12	0.02	0.76	0.24
40	1499	31.13	5.52	4.05	0.79	21.77	37.94	0.00	101.20	2.03	0.64	0.34	0.05	2.00	2.96	0.00	8.03	0.66	0.21	0.11	0.02	0.76	0.24
41	1537	31.53	5.02	4.21	0.64	21.20	37.93	0.11	100.54	2.08	0.59	0.36	0.04	1.97	2.99	0.01	8.03	0.68	0.19	0.12	0.01	0.78	0.22
43	1614	31.14	5.18	4.26	0.86	21.51	38.18	0.03	101.12	2.04	0.60	0.36	0.06	1.98	2.99	0.00	8.02	0.67	0.20	0.12	0.02	0.77	0.23
44	1652	30.94	5.37	4.08	0.74	21.45	38.34	0.06	100.90	2.02	0.63	0.34	0.05	1.98	3.00	0.00	8.01	0.67	0.21	0.11	0.02	0.76	0.24
45	1691	30.93	5.70	4.16	0.81	21.60	38.59	0.05	101.78	2.00	0.66	0.35	0.05	1.97	2.99	0.00	8.02	0.65	0.21	0.11	0.02	0.75	0.25
46	1729	30.69	5.23	3.99	0.78	20.82	36.60	0.15	98.12	2.08	0.63	0.35	0.05	1.98	2.96	0.01	8.05	0.67	0.20	0.11	0.02	0.77	0.23
47	1768	31.17	5.74	4.00	0.61	21.38	37.81	0.01	100.70	2.05	0.67	0.34	0.04	1.98	2.97	0.00	8.04	0.66	0.22	0.11	0.01	0.75	0.25
48	1806	30.17	5.29	4.10	0.69	22.60	37.38	0.00	100.22	1.98	0.62	0.35	0.05	2.09	2.94	0.00	8.02	0.66	0.21	0.12	0.02	0.76	0.24
49	1845	31.09	5.80	4.24	0.77	21.92	38.90	0.00	102.72	1.99	0.66	0.35	0.05	1.98	2.98	0.00	8.02	0.65	0.22	0.11	0.02	0.75	0.25
50	1883	30.68	5.68	4.17	0.63	21.34	38.21	0.03	100.72	2.01	0.66	0.35	0.04	1.97	2.99	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
51	1922	30.68	5.84	4.17	0.71	21.73	38.65	0.15	101.80	1.98	0.67	0.35	0.05	1.98	2.99	0.01	8.02	0.65	0.22	0.11	0.02	0.75	0.25
52	1960	31.24	5.69	4.15	0.90	21.29	37.85	0.15	101.12	2.05	0.66	0.35	0.06	1.97	2.97	0.01	8.05	0.66	0.21	0.11	0.02	0.75	0.25
53	1998	30.74	5.65	4.11	0.70	21.69	38.46	0.08	101.36	2.00	0.66	0.34	0.05	1.99	2.99	0.00	8.02	0.66	0.22	0.11	0.02	0.75	0.25
54	2037	30.67	5.65	4.23	0.85	21.30	37.47	0.00	100.16	2.03	0.67	0.36	0.06	1.98	2.96	0.00	8.05	0.65	0.21	0.12	0.02	0.75	0.25
55	2075	30.60	5.68	4.23	0.81	21.56	38.57	0.00	101.44	1.99	0.66	0.35	0.05	1.97	2.99	0.00	8.02	0.65	0.22	0.12	0.02	0.75	0.25
56	2114	31.14	5.69	4.24	0.78	21.48	38.00	0.00	101.34	2.03	0.66	0.36	0.05	1.98	2.97	0.00	8.05	0.66	0.21	0.11	0.02	0.75	0.25
57	2152	32.08	4.46	4.34	0.78	21.40	38.14	0.02	101.20	2.11	0.52	0.36	0.05	1.98	2.99	0.00	8.02	0.69	0.17	0.12	0.02	0.80	0.20
58	2191	32.19	3.87	4.16	0.90	21.12	37.25	0.24	99.50	2.16	0.46	0.36	0.06	1.99	2.99	0.01	8.02	0.71	0.15	0.12	0.02	0.82	0.18
60	2267	30.79	5.67	4.23	0.81	21.52	38.18	0.17	101.20	2.01	0.66	0.35	0.05	1.98	2.98	0.01	8.03	0.65	0.21	0.11	0.02	0.75	0.25
61	2306	31.80	4.27	4.17	1.12	20.89	37.37	0.51	100.12	2.12	0.51	0.36	0.08	1.96	2.97	0.03	8.02	0.69	0.17	0.12	0.02	0.81	0.19
62	2344	31.17	5.36	4.31	0.82	21.39	38.20	0.06	101.26	2.04	0.62	0.36	0.05	1.97	2.98	0.00	8.03	0.66	0.20	0.12	0.02	0.77	0.23
63	2383	31.46	5.56	4.20	0.83	21.59	38.45	0.14	102.10	2.04	0.64	0.35	0.05	1.97	2.98	0.01	8.03	0.66	0.21	0.11	0.02	0.76	0.24
64	2421	30.85	5.73	4.13	0.86	21.76	37.95	0.03	101.28	2.01	0.67	0.35	0.06	2.00	2.96	0.00	8.04	0.65	0.22	0.11	0.02	0.75	0.25
65	2460	30.45	5.60	4.21	0.89	21.35	38.35	0.01	100.84	1.99	0.65	0.35	0.06	1.97	3.00	0.00	8.02	0.65	0.21	0.12	0.02	0.75	0.25
66	2498	31.10	5.27	4.18	0.91	21.25	38.08	0.00	100.78	2.04	0.62	0.35	0.06	1.97	2.99	0.00	8.03	0.67	0.20	0.11	0.02	0.77	0.23

67	2536	30.91	5.64	4.24	0.90	21.56	38.58	0.03	101.84	2.00	0.65	0.35	0.06	1.97	2.99	0.00	8.03	0.65	0.21	0.11	0.02	0.75	0.25
68	2575	30.26	5.07	4.33	0.68	20.47	36.79	0.09	97.60	2.05	0.61	0.38	0.05	1.96	2.99	0.01	8.03	0.66	0.20	0.12	0.02	0.77	0.23
70	2652	30.44	5.47	4.39	0.86	21.57	37.98	0.04	100.70	1.99	0.64	0.37	0.06	1.99	2.98	0.00	8.03	0.65	0.21	0.12	0.02	0.76	0.24
71	2690	30.34	5.54	4.37	0.94	21.61	38.08	0.06	100.86	1.98	0.65	0.37	0.06	1.99	2.98	0.00	8.03	0.65	0.21	0.12	0.02	0.75	0.25
72	2729	30.38	5.53	4.11	0.83	21.49	38.16	0.06	100.50	1.99	0.65	0.35	0.06	1.99	2.99	0.00	8.02	0.66	0.21	0.11	0.02	0.76	0.24
73	2767	30.32	5.65	4.18	0.97	21.60	38.15	0.36	101.22	1.97	0.66	0.35	0.06	1.98	2.97	0.02	8.02	0.65	0.22	0.11	0.02	0.75	0.25
77	2921	30.88	5.58	4.19	0.99	21.33	38.39	0.05	101.36	2.01	0.65	0.35	0.07	1.96	2.99	0.00	8.03	0.65	0.21	0.11	0.02	0.76	0.24
78	2959	30.62	5.50	4.11	0.89	21.34	38.19	0.05	100.66	2.01	0.64	0.35	0.06	1.97	2.99	0.00	8.02	0.66	0.21	0.11	0.02	0.76	0.24
79	2998	30.89	5.40	4.15	0.85	21.33	38.19	0.00	100.82	2.02	0.63	0.35	0.06	1.97	2.99	0.00	8.02	0.66	0.21	0.11	0.02	0.76	0.24
80	3036	30.78	5.54	4.31	0.88	21.65	38.10	0.00	101.26	2.01	0.64	0.36	0.06	1.99	2.97	0.00	8.03	0.65	0.21	0.12	0.02	0.76	0.24
81	3074	30.78	5.43	4.11	0.93	21.38	37.93	0.00	100.56	2.02	0.64	0.35	0.06	1.98	2.98	0.00	8.03	0.66	0.21	0.11	0.02	0.76	0.24
82	3113	31.52	5.53	4.33	0.69	21.66	38.70	0.04	102.44	2.03	0.64	0.36	0.05	1.97	2.99	0.00	8.03	0.66	0.21	0.12	0.01	0.76	0.24
83	3151	30.66	5.52	4.28	0.63	21.57	38.21	0.05	100.86	2.00	0.64	0.36	0.04	1.99	2.99	0.00	8.02	0.66	0.21	0.12	0.01	0.76	0.24
84	3190	30.46	5.75	4.47	0.80	21.68	38.29	0.00	101.44	1.98	0.67	0.37	0.05	1.99	2.98	0.00	8.03	0.64	0.22	0.12	0.02	0.75	0.25
85	3228	30.93	5.63	4.22	0.82	21.46	38.38	0.00	101.44	2.01	0.65	0.35	0.05	1.97	2.99	0.00	8.03	0.66	0.21	0.11	0.02	0.76	0.24
87	3305	31.35	5.49	4.36	0.88	21.50	38.22	0.13	101.82	2.04	0.64	0.36	0.06	1.97	2.97	0.01	8.04	0.66	0.21	0.12	0.02	0.76	0.24
90	3420	30.04	5.60	4.36	0.89	21.52	37.91	0.02	100.32	1.97	0.66	0.37	0.06	1.99	2.98	0.00	8.03	0.65	0.21	0.12	0.02	0.75	0.25
92	3497	30.65	5.49	4.29	0.80	21.68	38.24	0.31	101.46	1.99	0.64	0.36	0.05	1.99	2.97	0.02	8.02	0.66	0.21	0.12	0.02	0.76	0.24
93	3536	30.61	5.53	4.34	0.93	21.48	38.38	0.16	101.26	1.99	0.64	0.36	0.06	1.97	2.99	0.01	8.02	0.65	0.21	0.12	0.02	0.76	0.24
95	3612	30.50	5.66	4.24	0.98	21.34	38.44	0.13	101.14	1.99	0.66	0.35	0.06	1.96	3.00	0.01	8.02	0.65	0.21	0.12	0.02	0.75	0.25
96	3651	30.88	5.64	4.18	0.82	21.56	38.55	0.30	101.94	2.00	0.65	0.35	0.05	1.97	2.98	0.02	8.02	0.66	0.21	0.11	0.02	0.75	0.25
97	3689	30.59	5.67	4.18	0.91	21.81	38.15	0.42	101.72	1.98	0.66	0.35	0.06	1.99	2.96	0.02	8.02	0.65	0.22	0.11	0.02	0.75	0.25
98	3728	30.05	5.46	4.32	0.91	21.63	38.03	0.79	101.18	1.96	0.63	0.36	0.06	1.98	2.96	0.05	8.00	0.65	0.21	0.12	0.02	0.76	0.24
99	3766	30.42	5.65	4.14	0.83	21.84	38.50	0.13	101.38	1.97	0.65	0.34	0.05	2.00	2.99	0.01	8.01	0.65	0.22	0.11	0.02	0.75	0.25
100	3805	31.18	5.61	4.06	0.79	21.54	38.50	0.07	101.68	2.02	0.65	0.34	0.05	1.97	2.99	0.00	8.02	0.66	0.21	0.11	0.02	0.76	0.24
101	3843	30.77	5.50	4.25	0.81	21.53	38.28	0.00	101.14	2.01	0.64	0.36	0.05	1.98	2.99	0.00	8.02	0.66	0.21	0.12	0.02	0.76	0.24
102	3881	30.64	5.44	4.03	0.87	21.58	38.07	0.12	100.62	2.01	0.64	0.34	0.06	1.99	2.98	0.01	8.02	0.66	0.21	0.11	0.02	0.76	0.24
103	3920	31.11	5.50	4.06	0.76	21.74	37.91	0.18	101.08	2.03	0.64	0.34	0.05	2.00	2.96	0.01	8.03	0.66	0.21	0.11	0.02	0.76	0.24
104	3958	30.25	5.40	4.16	0.93	21.62	37.94	0.10	100.30	1.99	0.63	0.35	0.06	2.00	2.98	0.01	8.02	0.66	0.21	0.12	0.02	0.76	0.24
106	4035	30.67	5.71	4.09	0.67	21.55	38.42	0.04	101.12	2.00	0.66	0.34	0.04	1.98	2.99	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
108	4112	29.67	4.93	3.92	0.76	22.29	39.81	0.08	102.20	1.90	0.56	0.32	0.05	2.01	3.05	0.00	8.01	0.67	0.20	0.11	0.02	0.77	0.23
109	4150	31.24	5.79	3.95	0.87	21.92	38.51	0.28	102.56	2.01	0.66	0.33	0.06	1.99	2.96	0.02	8.03	0.66	0.22	0.11	0.02	0.75	0.25
110	4189	30.71	5.83	4.11	1.01	21.82	38.33	0.34	102.14	1.98	0.67	0.34	0.07	1.99	2.96	0.02	8.03	0.65	0.22	0.11	0.02	0.75	0.25
111	4227	30.86	5.69	4.10	0.82	21.58	38.30	0.12	101.34	2.01	0.66	0.34	0.05	1.98	2.98	0.01	8.03	0.66	0.22	0.11	0.02	0.75	0.25

112	4266	30.73	5.79	4.23	0.80	21.99	38.45	0.05	101.98	1.99	0.67	0.35	0.05	2.00	2.97	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
113	4304	30.81	5.77	4.11	0.99	21.79	38.41	0.00	101.88	2.00	0.67	0.34	0.07	1.99	2.97	0.00	8.03	0.65	0.22	0.11	0.02	0.75	0.25
114	4343	30.92	5.61	4.16	0.92	21.59	38.19	0.07	101.40	2.01	0.65	0.35	0.06	1.98	2.98	0.00	8.03	0.66	0.21	0.11	0.02	0.76	0.24
115	4381	30.91	5.58	4.20	0.85	21.37	38.33	0.10	101.24	2.02	0.65	0.35	0.06	1.96	2.99	0.01	8.03	0.66	0.21	0.11	0.02	0.76	0.24
116	4419	31.04	5.57	4.04	0.95	21.64	38.14	0.10	101.38	2.02	0.65	0.34	0.06	1.99	2.97	0.01	8.03	0.66	0.21	0.11	0.02	0.76	0.24
120	4573	31.99	5.02	3.92	0.81	21.70	38.13	0.13	101.58	2.09	0.58	0.33	0.05	2.00	2.98	0.01	8.03	0.68	0.19	0.11	0.02	0.78	0.22
121	4612	31.12	5.58	3.79	0.85	21.78	37.98	0.00	101.08	2.03	0.65	0.32	0.06	2.01	2.97	0.00	8.03	0.67	0.21	0.10	0.02	0.76	0.24
122	4650	31.02	5.78	3.76	0.80	21.70	38.08	0.05	101.14	2.02	0.67	0.31	0.05	2.00	2.97	0.00	8.03	0.66	0.22	0.10	0.02	0.75	0.25
123	4688	30.31	5.64	3.88	0.74	21.36	38.25	0.10	100.18	1.99	0.66	0.33	0.05	1.98	3.00	0.01	8.01	0.66	0.22	0.11	0.02	0.75	0.25
126	4804	30.97	5.76	3.89	0.75	21.65	38.54	0.23	101.56	2.01	0.67	0.32	0.05	1.98	2.99	0.01	8.02	0.66	0.22	0.11	0.02	0.75	0.25
127	4842	30.96	5.93	3.80	0.71	21.96	38.16	0.17	101.52	2.01	0.69	0.32	0.05	2.01	2.96	0.01	8.03	0.66	0.22	0.10	0.02	0.75	0.25
128	4881	30.78	5.93	3.71	0.83	21.88	38.12	0.10	101.24	2.00	0.69	0.31	0.05	2.01	2.97	0.01	8.03	0.66	0.23	0.10	0.02	0.74	0.26
129	4919	30.76	5.67	3.79	0.73	21.73	38.41	0.00	101.10	2.00	0.66	0.32	0.05	1.99	2.99	0.00	8.01	0.66	0.22	0.10	0.02	0.75	0.25
130	4957	30.39	5.86	3.90	0.72	22.00	38.25	0.00	101.12	1.98	0.68	0.32	0.05	2.02	2.97	0.00	8.02	0.65	0.22	0.11	0.02	0.74	0.26
131	4996	30.72	5.87	3.88	0.70	22.01	38.64	0.00	101.82	1.98	0.68	0.32	0.05	2.00	2.98	0.00	8.01	0.66	0.22	0.11	0.02	0.75	0.25
132	5034	30.59	5.91	3.93	0.73	21.95	38.69	0.06	101.80	1.98	0.68	0.33	0.05	2.00	2.99	0.00	8.01	0.65	0.22	0.11	0.02	0.74	0.26
133	5073	31.28	5.72	3.94	0.73	22.11	38.29	0.01	102.08	2.02	0.66	0.33	0.05	2.02	2.96	0.00	8.03	0.66	0.22	0.11	0.02	0.75	0.25
134	5111	30.82	5.90	3.99	0.62	22.05	38.41	0.00	101.78	1.99	0.68	0.33	0.04	2.01	2.97	0.00	8.02	0.65	0.22	0.11	0.01	0.75	0.25
135	5150	30.59	5.85	3.98	0.79	21.72	38.37	0.31	101.60	1.98	0.68	0.33	0.05	1.98	2.97	0.02	8.02	0.65	0.22	0.11	0.02	0.75	0.25
136	5188	30.63	5.97	3.88	0.81	21.67	38.45	0.11	101.40	1.99	0.69	0.32	0.05	1.98	2.98	0.01	8.02	0.65	0.23	0.11	0.02	0.74	0.26
137	5226	30.94	6.00	3.80	0.64	21.85	38.47	0.14	101.68	2.00	0.69	0.31	0.04	1.99	2.98	0.01	8.02	0.66	0.23	0.10	0.01	0.74	0.26
138	5265	30.50	5.85	3.88	0.62	21.53	38.15	0.00	100.52	2.00	0.68	0.33	0.04	1.99	2.99	0.00	8.02	0.66	0.22	0.11	0.01	0.75	0.25
139	5303	31.01	6.02	3.81	0.66	21.75	38.45	0.02	101.70	2.01	0.70	0.32	0.04	1.99	2.98	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
140	5342	30.75	5.95	3.82	0.81	22.09	38.60	0.00	102.02	1.98	0.68	0.32	0.05	2.01	2.98	0.00	8.02	0.65	0.23	0.10	0.02	0.74	0.26
141	5380	30.86	5.63	3.78	0.76	21.56	38.47	0.11	101.06	2.01	0.65	0.32	0.05	1.98	3.00	0.01	8.01	0.66	0.22	0.10	0.02	0.75	0.25
142	5419	30.94	5.65	3.75	0.77	21.94	38.39	0.00	101.44	2.01	0.65	0.31	0.05	2.01	2.98	0.00	8.02	0.66	0.22	0.10	0.02	0.75	0.25
143	5457	31.04	5.99	3.68	0.52	21.54	38.26	0.00	101.04	2.02	0.70	0.31	0.03	1.98	2.98	0.00	8.03	0.66	0.23	0.10	0.01	0.74	0.26
144	5495	31.45	5.84	3.77	0.72	21.82	38.73	0.13	102.32	2.03	0.67	0.31	0.05	1.98	2.99	0.01	8.02	0.66	0.22	0.10	0.02	0.75	0.25
145	5534	31.67	5.93	3.66	0.87	22.02	38.38	0.07	102.54	2.04	0.68	0.30	0.06	2.00	2.96	0.00	8.04	0.66	0.22	0.10	0.02	0.75	0.25
146	5572	31.54	5.94	3.27	0.57	21.87	38.12	0.09	101.30	2.05	0.69	0.27	0.04	2.01	2.97	0.01	8.03	0.67	0.23	0.09	0.01	0.75	0.25
147	5611	31.60	5.80	3.52	0.59	21.89	37.94	0.11	101.34	2.06	0.67	0.29	0.04	2.01	2.96	0.00	8.04	0.67	0.22	0.10	0.01	0.75	0.25
148	5649	31.59	5.73	3.46	0.68	22.07	38.51	0.08	102.04	2.04	0.66	0.29	0.04	2.01	2.98	0.00	8.02	0.67	0.22	0.09	0.01	0.76	0.24
149	5688	31.86	6.00	3.41	0.67	22.02	38.42	0.01	102.38	2.06	0.69	0.28	0.04	2.00	2.96	0.00	8.04	0.67	0.22	0.09	0.01	0.75	0.25
150	5726	31.66	5.71	3.34	0.61	21.61	38.32	0.00	101.24	2.06	0.66	0.28	0.04	1.99	2.99	0.00	8.02	0.68	0.22	0.09	0.01	0.76	0.24

Table 3.15.b: Qualitative trace element analyses of Garnet II from sample 282 along traverse A-B (Plate 6.9). Relative concentrations are measured in counts\second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1286	2690	1515	1048	2156	50	1838	1385	2963	1580	1047	2295	116	4314	1359	2759	1481	1064	2311
2	38	1581	2776	1489	996	2324	51	1876	1737	2987	1577	1067	2287	117	4351	1312	2742	1647	1053	2250
3	75	1248	2492	1553	1041	2194	54	1988	1322	2877	1557	1068	2294	118	4389	1418	2856	1501	1004	2267
4	113	1224	2741	1576	1129	2197	55	2026	1276	2809	1563	1055	2276	119	4426	1331	2679	1486	1031	2262
5	150	1257	2700	1592	1022	2129	56	2063	1154	2691	1555	1057	2255	120	4464	1348	2767	1559	1074	2243
6	188	1268	2640	1542	1020	2220	57	2101	1263	2791	1521	1012	2280	121	4501	1541	2657	1439	1017	2044
7	225	1251	2470	1579	1057	2206	58	2138	1385	2678	1549	1001	2253	122	4539	1957	2573	1516	1070	2200
8	263	1362	2651	1549	991	2141	59	2176	1835	2870	1512	1004	2366	125	4651	1351	2567	1518	1010	2175
9	300	1169	2617	1609	1074	2264	61	2251	1994	2851	1551	1023	2324	128	4764	1418	2562	1536	1048	2254
10	338	1228	2598	1540	1052	2217	63	2326	2240	2920	1619	1119	2261	129	4801	1282	2579	1610	1056	2227
11	375	1120	2552	1631	946	2390	66	2438	2177	2853	1517	1064	2241	130	4839	1734	2535	1553	1028	2191
12	413	1286	2701	1546	1015	2152	67	2476	2037	2870	1618	1053	2288	132	4914	2128	2539	1530	1054	2276
13	450	1174	2674	1569	1024	2201	68	2513	1402	2891	1500	1043	2332	133	4951	1320	2649	1519	1047	2265
14	488	1194	2532	1544	1139	2261	69	2551	1289	2894	1531	1033	2278	134	4989	1216	2597	1474	1021	2226
15	525	1158	2602	1518	1055	2288	71	2626	1516	2710	1571	1018	2288	135	5026	1263	2538	1538	1013	2325
16	563	1215	2677	1539	1044	2201	73	2701	2268	2811	1517	1073	2307	136	5064	1159	2528	1509	1075	2242
17	600	1308	2588	1522	1080	2202	74	2738	1785	2730	1584	1027	2282	137	5101	1190	2669	1450	1027	2286
18	638	1297	2708	1493	1063	2112	78	2888	1368	2776	1522	1050	2319	138	5139	1281	2805	1608	1044	2236
19	675	1285	2569	1586	1027	2184	79	2926	1224	2802	1531	1023	2292	139	5176	1228	2802	1569	1043	2233
20	713	1235	2459	1511	1039	2247	80	2963	1277	3052	1557	1081	2254	140	5214	1309	2720	1569	1107	2237
21	750	1312	2548	1541	1061	2237	81	3001	1194	2511	1576	1050	2373	141	5251	1303	2573	1532	1014	2208
22	788	1324	2677	1567	1025	2191	82	3038	1233	2610	1586	1062	2313	142	5289	1339	2660	1537	993	2166
24	863	1237	2619	1563	1033	2275	83	3076	1251	2796	1526	1085	2267	143	5326	1277	2672	1555	1063	2175
25	900	1344	2875	1581	975	2188	84	3113	1343	2869	1572	1093	2209	144	5364	1272	2672	1570	1099	2305
26	938	1864	2712	1531	1023	2212	86	3188	1410	2742	1479	1028	2244	145	5401	1443	2625	1561	1118	2158
27	975	1786	2558	1580	1059	2250	87	3226	1273	2728	1476	1067	2295	146	5439	1352	2645	1521	995	2139
29	1050	1159	2611	1534	998	2266	88	3263	1310	2675	1494	1067	2178	147	5476	1338	2591	1626	1083	2207
30	1088	1131	2560	1592	1098	2263	89	3301	1481	2812	1574	1060	2281	148	5514	1249	2595	1418	1030	2256
31	1125	1256	2474	1561	1119	2251	90	3338	1327	2612	1465	1053	2160	149	5551	1201	2649	1565	1012	2225
32	1163	1275	2648	1533	1086	2205	91	3376	1306	2776	1477	1026	2285	150	5589	1316	2611	1484	1073	2205
33	1200	1343	2669	1539	1052	2258	92	3413	1505	2707	1581	1024	2337							
35	1275	1291	2667	1524	1013	2205	95	3526	1669	2651	1504	983	2250							
36	1313	1325	2709	1454	1039	2186	96	3563	1409	2792	1552	1107	2224							
37	1350	1363	2770	1560	1031	2288	97	3601	1679	2677	1479	1097	2211							
38	1388	1554	2621	1538	1061	2213	101	3751	1425	2677	1551	994	2167							
40	1463	1546	2731	1474	982	2239	103	3826	1254	2500	1421	980	2082							
41	1500	1353	2798	1484	1079	2310	104	3864	1457	2607	1552	1081	2207							
42	1538	1600	2794	1510	1054	2251	106	3939	1539	2620	1472	1067	2215							
44	1613	1308	2787	1536	1007	2295	108	4014	1691	2722	1585	1055	2253							
45	1650	1486	2773	1499	967	2217	109	4051	1380	2672	1474	1080	2318							
46	1688	1717	2839	1479	1019	2318	110	4089	1385	2705	1504	1035	2285							
47	1725	1359	2817	1579	1069	2284	113	4201	1500	2707	1512	1019	2303							
48	1763	1291	2909	1501	1123	2182	114	4239	1999	2642	1573	1044	2259							
49	1800	1385	2907	1464	1043	2309	115	4276	2524	2532	1554	1024	2258							

Table 3.16a: Composition of Garnet I from sample 288 as analyzed along traverse A-B (Plate 7.6). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	32.32	5.66	2.54	1.37	21.57	37.80	0.00	101.26	2.12	0.66	0.21	0.09	1.99	2.96	0.00	8.04	0.69	0.21	0.07	0.03	0.76	0.24
2	19	32.88	5.81	2.27	1.35	21.75	38.02	0.01	102.08	2.14	0.67	0.19	0.09	1.99	2.96	0.00	8.04	0.69	0.22	0.06	0.03	0.76	0.24
3	39	32.58	6.00	2.38	1.35	21.62	37.53	0.00	101.46	2.13	0.70	0.20	0.09	2.00	2.94	0.00	8.06	0.68	0.22	0.06	0.03	0.75	0.25
4	58	32.70	5.93	2.20	1.33	21.33	37.16	0.00	100.65	2.16	0.70	0.19	0.09	1.99	2.94	0.00	8.07	0.69	0.22	0.06	0.03	0.76	0.24
5	78	32.85	5.77	2.24	1.14	21.32	36.93	0.01	100.26	2.18	0.68	0.19	0.08	2.00	2.93	0.00	8.07	0.70	0.22	0.06	0.02	0.76	0.24
6	97	32.81	5.95	2.12	1.42	21.52	37.36	0.00	101.17	2.16	0.70	0.18	0.09	2.00	2.94	0.00	8.06	0.69	0.22	0.06	0.03	0.76	0.24
7	116	32.46	5.80	2.25	1.44	21.54	37.83	0.06	101.31	2.13	0.68	0.19	0.10	1.99	2.96	0.00	8.04	0.69	0.22	0.06	0.03	0.76	0.24
8	136	32.97	6.05	2.09	1.22	21.33	38.05	0.09	101.71	2.15	0.70	0.17	0.08	1.96	2.97	0.01	8.05	0.69	0.23	0.06	0.03	0.75	0.25
9	155	32.95	6.12	2.08	1.27	21.97	37.97	0.08	102.37	2.14	0.71	0.17	0.08	2.01	2.94	0.00	8.05	0.69	0.23	0.06	0.03	0.75	0.25
10	174	32.51	5.99	2.27	1.44	21.68	37.36	0.01	101.25	2.13	0.70	0.19	0.10	2.01	2.93	0.00	8.06	0.68	0.22	0.06	0.03	0.75	0.25
11	194	31.81	6.07	2.27	1.25	21.87	37.60	0.09	100.86	2.09	0.71	0.19	0.08	2.02	2.95	0.01	8.04	0.68	0.23	0.06	0.03	0.75	0.25
12	213	32.45	6.24	2.19	1.50	21.81	37.56	0.08	101.75	2.12	0.73	0.18	0.10	2.01	2.93	0.00	8.07	0.68	0.23	0.06	0.03	0.74	0.26
13	233	32.65	6.35	2.21	1.31	21.88	37.80	0.04	102.19	2.12	0.73	0.18	0.09	2.00	2.94	0.00	8.06	0.68	0.24	0.06	0.03	0.74	0.26
14	252	32.36	6.03	2.08	1.29	21.21	37.51	0.00	100.48	2.14	0.71	0.18	0.09	1.97	2.96	0.00	8.05	0.69	0.23	0.06	0.03	0.75	0.25
15	271	32.11	5.99	2.29	1.28	21.88	37.93	0.15	101.49	2.09	0.70	0.19	0.08	2.01	2.96	0.01	8.04	0.68	0.23	0.06	0.03	0.75	0.25
16	291	32.53	6.13	2.13	1.26	22.03	38.16	0.00	102.25	2.11	0.71	0.18	0.08	2.01	2.96	0.00	8.04	0.69	0.23	0.06	0.03	0.75	0.25
17	310	32.53	6.30	2.23	1.41	21.98	37.77	0.04	102.23	2.11	0.73	0.19	0.09	2.01	2.93	0.00	8.06	0.68	0.23	0.06	0.03	0.74	0.26
18	329	32.88	6.17	2.26	1.27	21.73	37.70	0.00	102.02	2.14	0.72	0.19	0.08	2.00	2.94	0.00	8.06	0.68	0.23	0.06	0.03	0.75	0.25
19	349	32.10	6.10	2.32	1.48	21.55	38.01	0.00	101.56	2.09	0.71	0.19	0.10	1.98	2.97	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
20	368	31.78	6.21	2.36	1.18	21.80	38.08	0.08	101.41	2.07	0.72	0.20	0.08	2.00	2.97	0.00	8.03	0.68	0.24	0.06	0.03	0.74	0.26
22	407	31.89	6.05	2.40	1.33	21.43	37.46	0.00	100.56	2.10	0.71	0.20	0.09	1.99	2.95	0.00	8.05	0.68	0.23	0.07	0.03	0.75	0.25
23	426	32.80	6.06	2.26	1.15	21.51	37.69	0.00	101.48	2.15	0.71	0.19	0.08	1.99	2.95	0.00	8.06	0.69	0.23	0.06	0.02	0.75	0.25
24	446	32.21	6.04	2.27	1.38	21.80	38.01	0.00	101.71	2.10	0.70	0.19	0.09	2.00	2.96	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
25	465	32.31	6.01	2.34	1.47	21.64	37.84	0.07	101.60	2.11	0.70	0.20	0.10	1.99	2.96	0.00	8.05	0.68	0.23	0.06	0.03	0.75	0.25
26	485	33.29	5.58	2.43	1.23	21.81	38.15	0.12	102.48	2.16	0.65	0.20	0.08	1.99	2.96	0.01	8.04	0.70	0.21	0.07	0.03	0.77	0.23
38	717	32.91	5.23	2.28	1.41	21.09	37.27	0.06	100.19	2.19	0.62	0.19	0.10	1.98	2.97	0.00	8.04	0.71	0.20	0.06	0.03	0.78	0.22
41	775	31.98	5.84	2.43	1.21	21.62	37.40	0.00	100.48	2.11	0.69	0.21	0.08	2.01	2.95	0.00	8.04	0.68	0.22	0.07	0.03	0.75	0.25
42	795	31.48	6.27	2.43	1.45	22.15	38.11	0.00	101.88	2.04	0.72	0.20	0.10	2.02	2.95	0.00	8.04	0.67	0.24	0.07	0.03	0.74	0.26

44	833	32.26	6.24	2.44	1.23	21.94	37.56	0.12	101.67	2.10	0.73	0.20	0.08	2.02	2.93	0.01	8.06	0.68	0.23	0.07	0.03	0.74	0.26
45	853	32.00	6.37	2.33	1.19	21.87	37.79	0.06	101.54	2.09	0.74	0.19	0.08	2.01	2.94	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
46	872	31.43	6.39	2.21	1.39	21.41	37.64	0.00	100.45	2.07	0.75	0.19	0.09	1.99	2.96	0.00	8.04	0.67	0.24	0.06	0.03	0.73	0.27
47	891	31.99	6.39	2.19	1.05	21.72	38.21	0.00	101.55	2.08	0.74	0.18	0.07	1.99	2.97	0.00	8.03	0.68	0.24	0.06	0.02	0.74	0.26
50	950	31.86	6.04	2.18	1.10	21.67	37.95	0.00	100.80	2.09	0.71	0.18	0.07	2.00	2.97	0.00	8.03	0.68	0.23	0.06	0.02	0.75	0.25
51	969	32.08	6.24	2.31	1.31	21.36	37.59	0.15	100.89	2.11	0.73	0.19	0.09	1.98	2.95	0.01	8.06	0.68	0.23	0.06	0.03	0.74	0.26
53	1008	32.26	6.53	2.18	1.33	21.80	38.00	0.06	102.10	2.09	0.76	0.18	0.09	1.99	2.95	0.00	8.06	0.67	0.24	0.06	0.03	0.73	0.27
54	1027	31.31	6.48	2.28	1.29	21.68	38.07	0.00	101.12	2.04	0.75	0.19	0.09	1.99	2.97	0.00	8.03	0.66	0.25	0.06	0.03	0.73	0.27
56	1066	31.70	6.09	2.61	1.30	21.96	38.15	0.03	101.80	2.06	0.71	0.22	0.09	2.01	2.96	0.00	8.03	0.67	0.23	0.07	0.03	0.74	0.26
57	1085	31.95	6.56	2.33	1.15	21.80	37.74	0.11	101.53	2.08	0.76	0.19	0.08	2.00	2.94	0.01	8.06	0.67	0.24	0.06	0.02	0.73	0.27
58	1105	32.04	6.39	2.28	1.16	21.81	37.76	0.03	101.44	2.09	0.74	0.19	0.08	2.01	2.95	0.00	8.05	0.67	0.24	0.06	0.02	0.74	0.26
59	1124	32.40	6.47	2.28	1.37	21.85	37.97	0.00	102.33	2.10	0.75	0.19	0.09	2.00	2.94	0.00	8.06	0.67	0.24	0.06	0.03	0.74	0.26
61	1163	32.78	6.38	2.13	1.26	21.64	37.84	0.00	102.02	2.13	0.74	0.18	0.08	1.98	2.94	0.00	8.06	0.68	0.24	0.06	0.03	0.74	0.26
62	1182	32.50	6.32	2.02	1.06	21.95	37.87	0.00	101.73	2.11	0.73	0.17	0.07	2.01	2.95	0.00	8.05	0.69	0.24	0.05	0.02	0.74	0.26
63	1202	32.73	6.42	2.09	1.11	21.82	38.26	0.00	102.43	2.12	0.74	0.17	0.07	1.99	2.96	0.00	8.05	0.68	0.24	0.06	0.02	0.74	0.26
65	1240	32.29	6.45	2.17	1.26	21.69	37.72	0.01	101.58	2.11	0.75	0.18	0.08	2.00	2.94	0.00	8.06	0.67	0.24	0.06	0.03	0.74	0.26
66	1260	31.72	6.59	2.15	1.24	21.88	37.97	0.01	101.55	2.06	0.76	0.18	0.08	2.01	2.95	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
67	1279	32.34	6.28	2.05	1.27	21.66	37.69	0.00	101.29	2.12	0.73	0.17	0.08	2.00	2.95	0.00	8.05	0.68	0.24	0.06	0.03	0.74	0.26
68	1298	32.70	6.21	2.09	1.44	21.94	38.01	0.03	102.39	2.12	0.72	0.17	0.09	2.00	2.95	0.00	8.05	0.68	0.23	0.06	0.03	0.75	0.25
69	1318	32.58	6.31	2.02	1.33	22.07	37.72	0.00	102.04	2.12	0.73	0.17	0.09	2.02	2.93	0.00	8.06	0.68	0.24	0.05	0.03	0.74	0.26
70	1337	32.55	6.46	2.18	1.38	21.67	38.15	0.00	102.39	2.11	0.75	0.18	0.09	1.98	2.95	0.00	8.06	0.67	0.24	0.06	0.03	0.74	0.26
71	1357	32.41	6.26	2.14	1.18	21.80	37.87	0.00	101.67	2.11	0.73	0.18	0.08	2.00	2.95	0.00	8.05	0.68	0.23	0.06	0.03	0.74	0.26
72	1376	31.97	6.22	2.17	1.29	21.83	37.98	0.00	101.46	2.08	0.72	0.18	0.09	2.01	2.96	0.00	8.04	0.68	0.23	0.06	0.03	0.74	0.26
73	1395	32.27	6.26	2.11	1.45	21.97	38.08	0.00	102.13	2.09	0.72	0.18	0.10	2.01	2.95	0.00	8.04	0.68	0.23	0.06	0.03	0.74	0.26
74	1415	32.62	6.17	2.11	1.23	21.74	37.96	0.00	101.82	2.12	0.72	0.18	0.08	1.99	2.96	0.00	8.05	0.69	0.23	0.06	0.03	0.75	0.25
75	1434	32.35	6.52	2.05	1.35	21.55	37.89	0.12	101.71	2.11	0.76	0.17	0.09	1.98	2.95	0.01	8.06	0.67	0.24	0.05	0.03	0.74	0.26
76	1454	32.42	6.09	2.14	1.26	22.10	37.77	0.00	101.78	2.11	0.71	0.18	0.08	2.03	2.94	0.00	8.05	0.69	0.23	0.06	0.03	0.75	0.25
77	1473	32.77	6.51	2.12	1.31	21.74	37.57	0.00	102.03	2.13	0.76	0.18	0.09	2.00	2.93	0.00	8.08	0.68	0.24	0.06	0.03	0.74	0.26
78	1492	32.71	6.30	2.09	1.35	21.96	37.67	0.05	102.08	2.13	0.73	0.17	0.09	2.01	2.93	0.00	8.06	0.68	0.23	0.06	0.03	0.74	0.26
79	1512	32.58	6.31	2.06	1.24	21.55	37.36	0.06	101.10	2.14	0.74	0.17	0.08	2.00	2.94	0.00	8.07	0.68	0.24	0.06	0.03	0.74	0.26
80	1531	32.79	6.46	2.07	1.21	21.95	37.92	0.00	102.40	2.12	0.75	0.17	0.08	2.00	2.94	0.00	8.06	0.68	0.24	0.06	0.03	0.74	0.26
81	1550	32.95	6.40	2.10	1.39	21.83	37.88	0.00	102.55	2.14	0.74	0.17	0.09	1.99	2.93	0.00	8.07	0.68	0.24	0.06	0.03	0.74	0.26
82	1570	32.64	6.14	2.02	1.18	21.57	37.61	0.18	101.16	2.14	0.72	0.17	0.08	1.99	2.95	0.01	8.05	0.69	0.23	0.05	0.03	0.75	0.25
83	1589	33.13	6.50	2.06	1.10	22.00	37.89	0.00	102.69	2.14	0.75	0.17	0.07	2.00	2.93	0.00	8.07	0.68	0.24	0.05	0.02	0.74	0.26

84	1609	32.48	6.18	2.03	1.32	21.84	37.88	0.01	101.73	2.12	0.72	0.17	0.09	2.01	2.95	0.00	8.05	0.68	0.23	0.05	0.03	0.75	0.25
85	1628	32.64	6.09	2.09	1.47	21.69	37.78	0.06	101.76	2.13	0.71	0.17	0.10	2.00	2.95	0.00	8.05	0.68	0.23	0.06	0.03	0.75	0.25
86	1647	32.60	6.15	2.25	1.25	21.84	38.03	0.12	102.12	2.12	0.71	0.19	0.08	2.00	2.95	0.01	8.05	0.68	0.23	0.06	0.03	0.75	0.25
87	1667	32.47	6.12	2.05	1.43	21.93	37.90	0.04	101.90	2.11	0.71	0.17	0.09	2.01	2.95	0.00	8.05	0.68	0.23	0.06	0.03	0.75	0.25
88	1686	32.44	6.20	2.16	1.23	21.55	37.38	0.00	100.97	2.13	0.73	0.18	0.08	2.00	2.94	0.00	8.06	0.68	0.23	0.06	0.03	0.75	0.25
89	1705	32.59	6.04	2.16	1.20	21.73	37.70	0.00	101.41	2.13	0.70	0.18	0.08	2.00	2.95	0.00	8.05	0.69	0.23	0.06	0.03	0.75	0.25
90	1725	32.34	6.32	2.19	1.50	21.70	37.92	0.00	101.97	2.10	0.73	0.18	0.10	1.99	2.95	0.00	8.06	0.67	0.23	0.06	0.03	0.74	0.26
91	1744	33.12	6.27	2.10	1.22	21.90	38.12	0.00	102.74	2.14	0.72	0.17	0.08	1.99	2.95	0.00	8.06	0.69	0.23	0.06	0.03	0.75	0.25
92	1764	33.14	6.09	2.22	1.17	21.90	38.11	0.00	102.62	2.14	0.70	0.18	0.08	2.00	2.95	0.00	8.05	0.69	0.23	0.06	0.02	0.75	0.25
94	1802	32.49	6.01	2.02	1.27	21.51	37.25	0.00	100.54	2.15	0.71	0.17	0.09	2.00	2.94	0.00	8.06	0.69	0.23	0.05	0.03	0.75	0.25
95	1822	33.14	5.94	2.24	1.16	21.56	37.74	0.01	101.78	2.17	0.69	0.19	0.08	1.99	2.95	0.00	8.06	0.69	0.22	0.06	0.02	0.76	0.24
96	1841	33.16	5.65	2.13	1.49	21.74	38.01	0.05	102.17	2.16	0.66	0.18	0.10	1.99	2.96	0.00	8.04	0.70	0.21	0.06	0.03	0.77	0.23
97	1860	33.06	5.69	2.13	1.52	21.87	37.88	0.07	102.15	2.15	0.66	0.18	0.10	2.01	2.95	0.00	8.05	0.70	0.21	0.06	0.03	0.77	0.23
99	1899	33.20	5.17	2.06	1.55	20.79	36.52	0.09	99.29	2.24	0.62	0.18	0.11	1.98	2.95	0.01	8.07	0.71	0.20	0.06	0.03	0.78	0.22
100	1919	33.86	5.20	2.05	1.36	21.85	37.67	0.02	102.00	2.22	0.61	0.17	0.09	2.02	2.95	0.00	8.05	0.72	0.20	0.06	0.03	0.79	0.21

Table 3.16.b: Qualitative trace element analyses of Garnet I from sample 288 along traverse A-B (Plate 7.6). Relative concentrations are measured in counts\second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P
1	0	1156	2577	1613	1111	2315	46	872	1237	2596	1554	1082	2172	91	1744	1201	2421	1583	1058	2134
2	19	1184	2534	1587	1097	2381	47	891	1279	2559	1544	1031	2117	92	1764	1202	2569	1526	1119	2165
3	39	1155	2559	1617	1060	2178	48	911	1266	2550	1528	1035	2099	93	1783	1208	2655	1538	1096	2246
4	58	1288	2421	1378	1061	2031	49	930	1188	2564	1520	1085	2150	94	1802	1169	2603	1546	1043	2178
5	78	1232	2645	1575	1084	2239	50	950	1167	2503	1548	1036	2169	95	1822	1263	2655	1511	1116	2198
6	97	1187	2592	1545	1156	2219	52	988	1207	2428	1601	1048	2118	96	1841	1215	2638	1542	1118	2240
7	116	1203	2595	1580	970	2533	53	1008	1215	2593	1617	1087	2164	97	1860	1203	2558	1586	1077	2171
8	136	1176	2621	1629	1095	2269	54	1027	1272	2638	1488	1119	2031	98	1880	1197	2626	1561	1099	2318
9	155	1224	2608	1563	1096	2112	55	1047	1204	2550	1640	980	2163	99	1899	1176	2602	1515	1049	2332
10	174	1162	2547	1585	1051	2119	56	1066	1212	2616	1589	1072	2111	100	1919	1145	2612	1525	1121	2235
11	194	1184	2623	1624	1034	2138	57	1085	1191	2567	1678	1104	2157							
12	213	1294	2533	1526	1095	2199	58	1105	1161	2635	1529	1064	2095							
13	233	1221	2492	1533	1063	2089	59	1124	1239	2540	1525	1025	2149							
14	252	1237	2523	1605	1077	2171	60	1143	1209	2576	1530	1175	2198							
15	271	1198	2573	1615	1048	2182	61	1163	1234	2564	1535	1095	2131							
16	291	1137	2519	1605	1016	2087	62	1182	1153	2447	1564	1088	2146							
17	310	1214	2495	1629	1043	2221	63	1202	1202	2529	1561	1045	2112							
19	349	1198	2565	1640	1050	2098	64	1221	1192	2536	1539	1158	2161							
20	368	1199	2531	1609	1028	2171	65	1240	1219	2470	1595	1104	2093							
21	388	1146	2677	1579	1073	2182	66	1260	1229	2475	1611	1093	2108							
22	407	1165	2507	1579	1110	2091	67	1279	1133	2622	1511	939	2164							
23	426	1108	2500	1528	1052	2135	68	1298	1206	2487	1502	1054	2321							
24	446	1188	2535	1562	1094	2125	69	1318	1182	2286	1654	965	2199							
25	465	1102	2597	1515	1087	2214	70	1337	1211	2489	1619	1103	2119							
26	485	1151	2515	1519	1054	2190	71	1357	1251	2625	1575	1140	2079							
27	504	1147	2537	1550	1036	2092	72	1376	1186	2496	1578	1109	2093							
28	523	1211	2529	1559	1067	2178	73	1395	1158	2552	1616	1129	2115							
29	543	1228	2504	1595	1101	2178	74	1415	1218	2464	1646	1093	2166							
30	562	1194	2547	1607	1112	2140	75	1434	1231	2494	1574	1057	2050							
31	581	1221	2467	1506	1096	2085	76	1454	1293	2485	1572	1116	2042							
32	601	1231	2551	1608	1084	2188	77	1473	1282	2582	1635	1060	2054							
33	620	1161	2593	1622	1059	2130	78	1492	1208	2557	1561	1079	2096							
34	640	1283	2522	1626	1134	2173	79	1512	1242	2529	1567	1122	2043							
35	659	1232	2604	1590	977	2119	80	1531	1237	2482	1565	1071	2178							
36	678	1191	2561	1639	1049	2100	81	1550	1161	2523	1566	1078	2177							
37	698	1229	2586	1564	1023	2100	82	1570	1216	2531	1516	1091	2203							
38	717	1127	2526	1623	1048	2141	83	1589	1217	2534	1507	1047	2180							
39	736	1180	2496	1594	1031	2155	84	1609	1184	2412	1547	1139	2217							
40	756	1187	2569	1492	1065	2145	85	1628	1179	2438	1505	1072	2207							
41	775	1177	2479	1511	1067	2216	86	1647	1328	2494	1562	1068	2188							
42	795	1231	2485	1592	1120	2112	87	1667	1146	2582	1600	1095	2238							
43	814	1222	2533	1456	983	2091	88	1686	1222	2537	1539	1121	2143							
44	833	1211	2539	1576	1048	2078	89	1705	1235	2563	1587	1067	2198							
45	853	1165	2562	1575	1072	2056	90	1725	1174	2505	1623	1051	2366							

Table 3.17a: Composition of Garnet I from sample 288 as analyzed along traverse C-D (Plate 7.6). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	30.96	5.99	2.50	1.49	21.81	37.93	0.00	100.68	2.03	0.70	0.21	0.10	2.01	2.97	0.00	8.02	0.67	0.23	0.07	0.03	0.74	0.26
2	10	31.35	5.99	2.43	1.17	21.74	38.09	0.03	100.78	2.05	0.70	0.20	0.08	2.01	2.98	0.00	8.02	0.68	0.23	0.07	0.03	0.75	0.25
3	21	31.65	6.18	2.28	1.37	21.95	38.03	0.04	101.47	2.06	0.72	0.19	0.09	2.01	2.96	0.00	8.03	0.67	0.23	0.06	0.03	0.74	0.26
4	31	31.41	6.11	2.27	1.41	21.91	37.85	0.03	100.95	2.05	0.71	0.19	0.09	2.02	2.96	0.00	8.03	0.67	0.23	0.06	0.03	0.74	0.26
5	42	31.69	6.10	2.26	1.20	22.00	37.84	0.00	101.08	2.07	0.71	0.19	0.08	2.03	2.96	0.00	8.03	0.68	0.23	0.06	0.03	0.74	0.26
6	52	31.72	6.17	2.49	1.26	21.84	38.17	0.03	101.63	2.06	0.71	0.21	0.08	2.00	2.97	0.00	8.03	0.67	0.23	0.07	0.03	0.74	0.26
7	63	31.48	5.95	2.35	1.48	21.55	37.08	0.00	99.89	2.09	0.70	0.20	0.10	2.02	2.94	0.00	8.05	0.68	0.23	0.06	0.03	0.75	0.25
8	73	31.19	6.66	2.41	1.30	23.10	38.42	0.00	103.08	1.99	0.76	0.20	0.08	2.08	2.93	0.00	8.03	0.66	0.25	0.06	0.03	0.72	0.28
10	94	32.02	6.00	2.33	1.44	22.03	38.01	0.00	101.83	2.08	0.70	0.19	0.09	2.02	2.95	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
11	105	31.95	6.30	2.26	1.19	22.25	37.88	0.15	101.82	2.07	0.73	0.19	0.08	2.03	2.94	0.01	8.04	0.68	0.24	0.06	0.03	0.74	0.26
12	115	31.88	6.15	2.26	1.26	21.87	38.02	0.00	101.45	2.08	0.71	0.19	0.08	2.01	2.96	0.00	8.03	0.68	0.23	0.06	0.03	0.74	0.26
13	126	31.49	6.08	2.21	1.32	21.67	37.49	0.01	100.27	2.08	0.71	0.19	0.09	2.01	2.96	0.00	8.04	0.68	0.23	0.06	0.03	0.74	0.26
14	136	31.99	6.31	2.29	1.21	22.22	38.30	0.00	102.32	2.06	0.73	0.19	0.08	2.02	2.96	0.00	8.03	0.67	0.24	0.06	0.03	0.74	0.26
15	147	32.05	6.34	2.08	1.30	22.00	38.18	0.04	101.95	2.08	0.73	0.17	0.09	2.01	2.96	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
16	157	31.34	6.13	2.16	1.52	21.84	37.92	0.02	100.92	2.05	0.72	0.18	0.10	2.01	2.97	0.00	8.03	0.67	0.23	0.06	0.03	0.74	0.26
17	168	32.18	6.31	2.17	1.23	22.00	37.73	0.00	101.62	2.10	0.73	0.18	0.08	2.02	2.94	0.00	8.05	0.68	0.24	0.06	0.03	0.74	0.26
18	178	32.17	6.41	2.20	1.42	21.77	37.56	0.05	101.53	2.10	0.75	0.18	0.09	2.00	2.93	0.00	8.06	0.67	0.24	0.06	0.03	0.74	0.26
19	189	31.75	6.11	2.09	1.26	21.77	38.02	0.09	101.00	2.08	0.71	0.17	0.08	2.01	2.97	0.01	8.02	0.68	0.23	0.06	0.03	0.74	0.26
20	199	32.10	6.24	2.12	1.38	21.99	38.49	0.06	102.31	2.07	0.72	0.18	0.09	2.00	2.97	0.00	8.03	0.68	0.23	0.06	0.03	0.74	0.26
21	210	31.62	5.98	2.08	1.35	21.50	37.48	0.00	100.01	2.09	0.71	0.18	0.09	2.00	2.96	0.00	8.03	0.68	0.23	0.06	0.03	0.75	0.25
22	220	31.88	6.00	2.09	1.31	21.67	38.12	0.00	101.06	2.08	0.70	0.17	0.09	2.00	2.98	0.00	8.02	0.68	0.23	0.06	0.03	0.75	0.25
23	231	31.61	6.44	1.96	1.34	21.95	37.90	0.07	101.21	2.06	0.75	0.16	0.09	2.02	2.96	0.00	8.04	0.67	0.24	0.05	0.03	0.73	0.27
24	241	31.18	6.19	2.01	1.36	21.66	37.91	0.10	100.61	2.05	0.72	0.17	0.09	2.00	2.97	0.01	8.05	0.68	0.24	0.06	0.03	0.74	0.26
25	252	31.24	6.26	1.99	1.34	21.97	38.29	0.08	101.07	2.03	0.73	0.17	0.09	2.02	2.98	0.00	8.01	0.67	0.24	0.06	0.03	0.74	0.26
26	262	31.45	6.30	1.90	1.45	21.74	37.85	0.00	100.99	2.06	0.74	0.16	0.10	2.00	2.96	0.00	8.06	0.68	0.24	0.05	0.03	0.74	0.26
27	272	31.95	6.31	1.95	1.15	21.77	37.73	0.00	100.85	2.09	0.74	0.16	0.08	2.01	2.96	0.00	8.04	0.68	0.24	0.05	0.02	0.74	0.26
28	283	31.47	6.23	1.98	1.27	21.76	37.88	0.02	100.60	2.06	0.73	0.17	0.08	2.01	2.97	0.00	8.02	0.68	0.24	0.05	0.03	0.74	0.26
29	293	32.35	6.29	1.86	1.27	21.88	38.33	0.00	101.96	2.10	0.73	0.15	0.08	2.00	2.97	0.00	8.03	0.69	0.24	0.05	0.03	0.74	0.26

30	304	31.76	6.47	2.15	1.40	21.73	37.83	0.00	101.35	2.07	0.75	0.18	0.09	2.00	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
31	314	32.29	6.43	2.07	1.66	22.32	38.09	0.04	102.87	2.08	0.74	0.17	0.11	2.03	2.93	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
32	325	32.13	6.38	1.85	1.19	21.93	38.13	0.00	101.62	2.09	0.74	0.15	0.08	2.01	2.96	0.00	8.03	0.68	0.24	0.05	0.03	0.74	0.26
33	335	31.55	6.38	1.94	1.21	21.78	38.11	0.09	100.96	2.06	0.74	0.16	0.08	2.00	2.97	0.01	8.02	0.68	0.24	0.05	0.03	0.73	0.27
34	346	31.97	6.64	1.91	1.35	21.65	37.95	0.14	101.47	2.08	0.77	0.16	0.09	1.99	2.96	0.01	8.05	0.67	0.25	0.05	0.03	0.73	0.27
35	356	31.77	6.49	2.04	1.29	21.85	37.79	0.00	101.23	2.07	0.75	0.17	0.09	2.01	2.95	0.00	8.04	0.67	0.24	0.06	0.03	0.73	0.27
36	367	31.38	6.49	1.99	1.34	21.72	37.94	0.14	100.87	2.05	0.76	0.17	0.09	2.00	2.97	0.01	8.03	0.67	0.25	0.05	0.03	0.73	0.27
37	377	31.42	6.44	1.90	1.28	22.01	37.95	0.04	100.98	2.05	0.75	0.16	0.08	2.02	2.96	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
38	388	31.79	6.32	2.08	1.30	21.80	38.17	0.05	101.45	2.07	0.73	0.17	0.09	2.00	2.97	0.00	8.03	0.68	0.24	0.06	0.03	0.74	0.26
39	398	31.98	6.59	1.92	1.28	21.92	38.09	0.00	101.77	2.08	0.76	0.16	0.08	2.00	2.96	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
40	409	31.28	6.40	2.02	1.26	21.84	38.00	0.00	100.78	2.04	0.75	0.17	0.08	2.01	2.97	0.00	8.02	0.67	0.25	0.06	0.03	0.73	0.27
41	419	31.65	6.52	1.95	1.36	21.60	38.17	0.08	101.25	2.06	0.76	0.16	0.09	1.98	2.97	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
42	430	31.46	6.69	1.90	1.32	22.05	38.09	0.08	101.51	2.04	0.77	0.16	0.09	2.02	2.96	0.01	8.04	0.67	0.25	0.05	0.03	0.73	0.27
43	440	31.79	6.57	1.94	1.34	21.79	38.14	0.00	101.57	2.07	0.76	0.16	0.09	2.00	2.96	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
44	451	31.75	6.63	2.02	1.17	21.91	37.89	0.00	101.38	2.07	0.77	0.17	0.08	2.01	2.95	0.00	8.04	0.67	0.25	0.05	0.02	0.73	0.27
45	461	31.53	6.51	1.83	1.21	21.77	37.66	0.00	100.49	2.07	0.76	0.15	0.08	2.01	2.96	0.00	8.04	0.68	0.25	0.05	0.03	0.73	0.27
46	472	31.74	6.54	2.06	1.20	21.57	37.70	0.00	100.81	2.08	0.76	0.17	0.08	1.99	2.96	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
47	482	31.89	6.43	1.97	1.30	22.07	37.77	0.02	101.43	2.08	0.75	0.16	0.09	2.03	2.94	0.00	8.04	0.68	0.24	0.05	0.03	0.74	0.26
48	493	31.24	6.83	2.03	1.51	22.21	38.15	0.04	101.99	2.02	0.79	0.17	0.10	2.02	2.95	0.00	8.04	0.66	0.26	0.05	0.03	0.72	0.28
49	503	31.81	6.57	2.05	1.43	21.68	37.95	0.06	101.48	2.07	0.76	0.17	0.09	1.99	2.96	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
50	514	31.61	6.64	2.06	1.32	21.58	38.11	0.05	101.32	2.06	0.77	0.17	0.09	1.98	2.97	0.00	8.04	0.67	0.25	0.06	0.03	0.73	0.27
51	524	31.46	6.61	1.91	1.23	21.82	38.00	0.15	101.31	2.05	0.77	0.16	0.08	2.00	2.96	0.01	8.06	0.67	0.25	0.05	0.03	0.73	0.27
52	534	31.93	6.53	2.06	1.39	21.66	37.93	0.00	101.51	2.08	0.76	0.17	0.09	1.99	2.96	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
53	545	30.89	6.46	1.87	1.29	21.74	37.79	0.04	100.05	2.03	0.76	0.16	0.09	2.01	2.97	0.00	8.02	0.67	0.25	0.05	0.03	0.73	0.27
54	555	31.24	6.50	1.93	1.38	21.44	37.88	0.00	100.38	2.05	0.76	0.16	0.09	1.99	2.98	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
55	566	31.67	6.56	1.95	1.16	22.09	37.72	0.06	101.14	2.07	0.76	0.16	0.08	2.03	2.94	0.00	8.04	0.67	0.25	0.05	0.02	0.73	0.27
56	576	30.88	6.29	2.00	1.24	21.57	37.79	0.02	99.76	2.04	0.74	0.17	0.08	2.01	2.98	0.00	8.02	0.67	0.24	0.06	0.03	0.73	0.27
57	587	31.65	6.49	2.11	1.30	21.79	38.02	0.03	101.35	2.06	0.75	0.18	0.09	2.00	2.96	0.00	8.04	0.67	0.24	0.06	0.03	0.73	0.27
58	597	31.78	6.69	2.08	1.22	21.83	37.99	0.00	101.59	2.07	0.78	0.17	0.08	2.00	2.95	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
59	608	31.87	6.62	2.03	1.19	22.04	37.76	0.00	101.50	2.07	0.77	0.17	0.08	2.02	2.94	0.00	8.05	0.67	0.25	0.05	0.03	0.73	0.27
60	618	31.32	6.64	1.98	1.14	22.34	38.15	0.00	101.58	2.03	0.77	0.16	0.07	2.04	2.95	0.00	8.03	0.67	0.25	0.05	0.02	0.73	0.27
61	629	31.84	6.64	1.93	1.14	22.35	38.47	0.00	102.37	2.05	0.76	0.16	0.07	2.03	2.96	0.00	8.03	0.67	0.25	0.05	0.02	0.73	0.27
63	650	31.64	6.57	2.02	1.26	21.79	37.93	0.11	101.22	2.06	0.76	0.17	0.08	2.00	2.96	0.01	8.04	0.67	0.25	0.05	0.03	0.73	0.27
64	660	31.84	6.82	2.07	1.27	22.30	37.78	0.00	102.09	2.06	0.79	0.17	0.08	2.03	2.92	0.00	8.06	0.66	0.25	0.06	0.03	0.72	0.28

65	671	31.43	6.25	1.95	1.35	21.83	37.67	0.06	100.48	2.07	0.73	0.16	0.09	2.02	2.96	0.00	8.03	0.68	0.24	0.05	0.03	0.74	0.26
66	681	32.12	6.63	1.95	1.16	21.89	38.21	0.00	101.96	2.08	0.77	0.16	0.08	2.00	2.96	0.00	8.04	0.67	0.25	0.05	0.02	0.73	0.27
67	692	31.03	6.62	2.09	1.38	21.94	38.02	0.00	101.08	2.02	0.77	0.17	0.09	2.01	2.96	0.00	8.03	0.66	0.25	0.06	0.03	0.72	0.28
68	702	31.73	6.39	2.15	1.31	21.67	37.77	0.14	101.02	2.08	0.75	0.18	0.09	2.00	2.96	0.01	8.04	0.67	0.24	0.06	0.03	0.74	0.26
69	713	31.15	6.41	2.23	1.43	22.22	38.45	0.04	101.89	2.01	0.74	0.18	0.09	2.02	2.97	0.00	8.02	0.66	0.24	0.06	0.03	0.73	0.27
70	723	31.40	6.40	2.16	1.06	21.72	37.94	0.01	100.68	2.06	0.75	0.18	0.07	2.00	2.97	0.00	8.03	0.67	0.24	0.06	0.02	0.73	0.27
72	744	30.88	6.35	2.40	1.06	22.28	38.60	0.00	101.56	1.99	0.73	0.20	0.07	2.03	2.98	0.00	8.00	0.67	0.24	0.07	0.02	0.73	0.27
73	755	31.02	6.33	2.23	1.36	21.81	38.46	0.00	101.21	2.02	0.73	0.19	0.09	2.00	2.99	0.00	8.01	0.67	0.24	0.06	0.03	0.73	0.27
74	765	30.94	6.36	2.21	1.23	21.83	37.71	0.02	100.28	2.03	0.74	0.19	0.08	2.02	2.96	0.00	8.03	0.67	0.24	0.06	0.03	0.73	0.27
75	776	31.38	6.23	2.06	1.18	21.57	37.52	0.02	99.95	2.07	0.73	0.17	0.08	2.01	2.96	0.00	8.03	0.68	0.24	0.06	0.03	0.74	0.26
76	786	31.72	6.08	2.17	1.20	21.22	37.39	0.00	99.77	2.10	0.72	0.18	0.08	1.98	2.97	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
80	828	30.22	6.58	2.18	1.40	22.39	38.36	0.00	101.13	1.96	0.76	0.18	0.09	2.04	2.97	0.00	8.01	0.65	0.25	0.06	0.03	0.72	0.28
81	838	30.37	6.06	2.38	1.25	21.37	37.12	0.00	98.56	2.03	0.72	0.20	0.09	2.01	2.97	0.00	8.02	0.67	0.24	0.07	0.03	0.74	0.26
107	1111	32.38	6.09	2.15	1.29	21.81	37.83	0.00	101.54	2.11	0.71	0.18	0.09	2.01	2.95	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
108	1121	32.35	6.27	2.19	1.40	21.79	38.04	0.06	102.03	2.10	0.73	0.18	0.09	1.99	2.95	0.00	8.05	0.68	0.23	0.06	0.03	0.74	0.26
109	1132	32.09	6.37	2.19	1.20	21.89	38.28	0.05	102.03	2.08	0.73	0.18	0.08	2.00	2.96	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
110	1142	32.33	6.10	2.21	1.27	21.67	38.23	0.02	101.80	2.10	0.71	0.18	0.08	1.99	2.97	0.00	8.03	0.68	0.23	0.06	0.03	0.75	0.25
111	1153	32.18	6.22	2.09	1.41	21.75	37.83	0.01	101.48	2.10	0.72	0.18	0.09	2.00	2.95	0.00	8.05	0.68	0.23	0.06	0.03	0.74	0.26
112	1163	31.78	6.30	2.02	1.27	21.94	38.18	0.00	101.50	2.07	0.73	0.17	0.08	2.01	2.97	0.00	8.03	0.68	0.24	0.06	0.03	0.74	0.26
113	1174	31.64	6.52	2.04	1.17	22.01	37.88	0.15	101.53	2.06	0.76	0.17	0.08	2.02	2.95	0.01	8.07	0.67	0.25	0.06	0.03	0.73	0.27
114	1184	31.71	6.47	2.09	1.38	21.71	37.70	0.00	101.07	2.07	0.75	0.18	0.09	2.00	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
115	1195	31.70	6.49	2.04	1.28	21.55	38.20	0.08	101.26	2.07	0.75	0.17	0.08	1.98	2.98	0.00	8.03	0.67	0.25	0.06	0.03	0.73	0.27
116	1205	31.54	6.42	2.03	1.26	21.84	37.93	0.00	101.02	2.06	0.75	0.17	0.08	2.01	2.96	0.00	8.03	0.67	0.24	0.06	0.03	0.73	0.27
117	1216	31.51	6.38	2.04	1.14	21.64	37.98	0.02	100.70	2.06	0.74	0.17	0.08	2.00	2.97	0.00	8.03	0.68	0.24	0.06	0.02	0.73	0.27
118	1226	31.82	6.27	1.98	1.05	21.73	37.84	0.00	100.68	2.09	0.73	0.17	0.07	2.01	2.97	0.00	8.03	0.68	0.24	0.05	0.02	0.74	0.26
120	1247	32.62	6.47	1.91	1.19	21.78	37.76	0.14	101.74	2.13	0.75	0.16	0.08	2.00	2.94	0.01	8.06	0.68	0.24	0.05	0.03	0.74	0.26
121	1258	31.80	6.53	1.95	1.28	21.87	37.84	0.00	101.28	2.07	0.76	0.16	0.08	2.01	2.95	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
122	1268	31.81	6.40	2.02	1.32	22.30	38.08	0.00	101.94	2.06	0.74	0.17	0.09	2.03	2.95	0.00	8.03	0.67	0.24	0.05	0.03	0.74	0.26
123	1279	31.55	6.63	1.94	1.28	22.02	38.00	0.08	101.42	2.05	0.77	0.16	0.08	2.02	2.95	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
124	1289	32.12	6.51	1.96	1.30	21.82	38.16	0.12	101.88	2.08	0.75	0.16	0.09	2.00	2.96	0.01	8.04	0.68	0.24	0.05	0.03	0.73	0.27
125	1300	31.42	6.25	1.93	1.19	21.64	37.59	0.00	100.02	2.07	0.74	0.16	0.08	2.01	2.97	0.00	8.03	0.68	0.24	0.05	0.03	0.74	0.26
126	1310	31.91	6.69	1.94	1.37	22.08	38.32	0.02	102.31	2.06	0.77	0.16	0.09	2.01	2.96	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
127	1320	31.82	6.44	1.80	1.29	21.97	37.99	0.00	101.30	2.07	0.75	0.15	0.09	2.02	2.96	0.00	8.03	0.68	0.24	0.05	0.03	0.73	0.27
128	1331	32.00	6.58	2.02	1.21	22.09	38.38	0.00	102.29	2.06	0.76	0.17	0.08	2.01	2.96	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27

129	1341	31.06	6.28	1.92	1.23	21.76	37.51	0.00	99.77	2.05	0.74	0.16	0.08	2.03	2.96	0.00	8.02	0.68	0.24	0.05	0.03	0.74	0.26
130	1352	32.32	6.46	1.90	1.26	22.00	38.12	0.04	102.06	2.09	0.75	0.16	0.08	2.01	2.95	0.00	8.04	0.68	0.24	0.05	0.03	0.74	0.26
131	1362	31.71	6.47	2.00	1.46	21.88	37.87	0.00	101.39	2.07	0.75	0.17	0.10	2.01	2.95	0.00	8.04	0.67	0.24	0.05	0.03	0.73	0.27
132	1373	31.40	6.37	1.91	1.38	21.84	37.69	0.00	100.58	2.06	0.74	0.16	0.09	2.02	2.96	0.00	8.03	0.67	0.24	0.05	0.03	0.73	0.27
133	1383	32.11	6.55	1.90	1.19	21.67	37.90	0.00	101.32	2.10	0.76	0.16	0.08	1.99	2.96	0.00	8.05	0.68	0.25	0.05	0.03	0.73	0.27
134	1394	31.77	6.49	2.10	1.38	22.00	37.83	0.07	101.57	2.07	0.75	0.18	0.09	2.02	2.94	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
135	1404	31.52	6.34	1.91	1.17	21.61	37.65	0.02	100.20	2.08	0.74	0.16	0.08	2.01	2.97	0.00	8.03	0.68	0.24	0.05	0.03	0.74	0.26
136	1415	31.84	6.74	1.97	1.12	21.94	38.38	0.00	101.98	2.06	0.78	0.16	0.07	2.00	2.97	0.00	8.03	0.67	0.25	0.05	0.02	0.73	0.27
137	1425	32.22	6.40	2.02	1.32	21.92	38.12	0.01	102.00	2.09	0.74	0.17	0.09	2.00	2.96	0.00	8.04	0.68	0.24	0.05	0.03	0.74	0.26
138	1436	31.64	6.40	2.13	1.29	22.29	38.90	0.00	102.65	2.03	0.73	0.17	0.08	2.01	2.98	0.00	8.01	0.67	0.24	0.06	0.03	0.73	0.27
140	1457	31.86	6.30	2.10	1.24	21.57	37.43	0.08	100.51	2.10	0.74	0.18	0.08	2.00	2.95	0.00	8.05	0.68	0.24	0.06	0.03	0.74	0.26
141	1467	31.96	6.36	2.08	1.19	21.72	38.09	0.10	101.41	2.08	0.74	0.17	0.08	1.99	2.97	0.01	8.04	0.68	0.24	0.06	0.03	0.74	0.26
142	1478	31.49	6.35	2.06	1.03	21.62	38.19	0.00	100.75	2.06	0.74	0.17	0.07	1.99	2.99	0.00	8.02	0.68	0.24	0.06	0.02	0.74	0.26
143	1488	31.57	6.27	2.05	1.25	21.50	37.82	0.00	100.46	2.08	0.74	0.17	0.08	1.99	2.97	0.00	8.03	0.68	0.24	0.06	0.03	0.74	0.26
144	1499	32.08	6.21	2.11	1.25	21.32	37.62	0.00	100.59	2.11	0.73	0.18	0.08	1.98	2.96	0.00	8.05	0.68	0.24	0.06	0.03	0.74	0.26
145	1509	31.38	6.19	2.12	1.29	21.69	37.80	0.04	100.46	2.06	0.72	0.18	0.09	2.01	2.97	0.00	8.03	0.68	0.24	0.06	0.03	0.74	0.26
146	1520	30.85	6.33	2.05	1.38	21.81	37.70	0.05	100.48	2.03	0.74	0.17	0.09	2.02	2.96	0.00	8.06	0.67	0.24	0.06	0.03	0.73	0.27
147	1530	31.47	6.46	2.12	1.25	21.91	37.85	0.00	101.05	2.05	0.75	0.18	0.08	2.02	2.95	0.00	8.04	0.67	0.25	0.06	0.03	0.73	0.27
148	1541	31.11	6.50	2.11	1.25	21.89	37.87	0.00	100.74	2.03	0.76	0.18	0.08	2.02	2.96	0.00	8.03	0.67	0.25	0.06	0.03	0.73	0.27
149	1551	31.95	6.51	2.30	1.30	22.10	37.86	0.00	102.01	2.07	0.75	0.19	0.09	2.02	2.94	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
150	1562	31.12	6.33	2.29	1.36	21.97	37.77	0.06	100.85	2.04	0.74	0.19	0.09	2.02	2.95	0.00	8.03	0.67	0.24	0.06	0.03	0.73	0.27

Table 3.17.b: Qualitative trace element analyses of Garnet I from sample 288 along traverse C-D (Plate 7.6). Relative concentrations are measured in counts\second. **D** = distance from starting point C in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P
1	0	1205	2714	1311	2389	2100	46	472	1188	3153	1386	2503	2143	117	1216	1157	3356	1345	2353	2272
2	10	1196	3248	1338	2447	2133	47	482	1211	3216	1429	2486	2196	118	1226	1226	3211	1357	2394	2121
3	21	1249	3343	1308	2429	2140	48	493	1252	3286	1379	2572	2146	119	1237	1107	3339	1404	2280	2083
4	31	1280	3094	1294	2405	2243	49	503	1184	3135	1361	2405	2221	120	1247	1224	3042	1328	2288	2088
5	42	1181	3299	1346	2447	2260	50	514	1190	3151	1308	2532	2139	121	1258	1194	3258	1400	2380	2179
6	52	1279	3209	1338	2428	2247	52	534	1203	3220	1322	2401	2081	122	1268	1173	3204	1410	2338	2116
7	63	1240	3262	1360	2515	2250	53	545	1160	3369	1341	2452	2221	123	1279	1190	3159	1416	2445	2202
8	73	1219	3700	1326	2382	2345	54	555	1159	3288	1332	2347	2115	124	1289	1206	3321	1318	2328	2143
9	84	1116	2983	1210	2334	1900	55	566	1169	3262	1413	2406	2156	125	1300	1179	3157	1306	2460	2089
11	105	1286	3155	1359	2417	2188	56	576	1243	3284	1386	2439	2210	126	1310	1193	3313	1366	2323	2243
12	115	1189	3239	1363	2431	2165	57	587	1194	3261	1272	2425	2123	127	1320	1205	3324	1409	2352	2264
13	126	1247	3200	1310	2365	2067	58	597	1145	3225	1354	2420	2063	128	1331	1212	3321	1363	2300	2206
14	136	1197	3066	1297	2432	2196	59	608	1049	3036	1270	2368	1930	129	1341	1234	3120	1373	2404	2245
15	147	1219	3307	1405	2422	2122	60	618	1244	3249	1358	2455	2159	130	1352	1156	3241	1403	2452	2180
16	157	1189	3072	1382	2555	2214	61	629	1162	3109	1362	2376	2150	131	1362	1176	3320	1453	2402	2217
17	168	1244	3094	1338	2429	2088	62	639	1148	3408	1368	2365	2141	132	1373	1188	3308	1409	2426	2237
18	178	1178	3383	1371	2528	2294	63	650	1221	3148	1384	2479	2198	133	1383	1185	3214	1364	2363	2131
19	189	1163	3170	1338	2447	2231	64	660	1177	3335	1363	2500	2125	134	1394	1207	3244	1385	2490	2247
20	199	1264	3325	1318	2522	2174	65	671	1179	3252	1376	2457	2180	135	1404	1061	2720	1299	2301	1993
21	210	1185	3188	1347	2472	2184	66	681	1203	3176	1339	2347	2159	136	1415	1213	3149	1397	2365	2033
22	220	1252	3250	1372	2454	2173	67	692	1181	3270	1354	2458	2258	137	1425	1144	3371	1359	2344	2226
23	231	1279	3165	1329	2532	2146	68	702	1194	3161	1366	2402	2201	138	1436	1233	3314	1447	2376	2091
24	241	1200	3105	1321	2503	2317	69	713	1164	3280	1395	2437	2227	139	1446	1218	3271	1370	2384	2155
25	252	1189	3271	1342	2441	2226	70	723	1199	3332	1347	2521	2194	140	1457	1160	3207	1381	2442	2141
26	262	1280	3216	1313	2433	2190	71	734	1185	3293	1340	2439	2273	141	1467	1165	3276	1367	2430	2146
27	272	1193	3133	1358	2476	2275	72	744	1262	3249	1355	2473	2132	142	1478	1227	3383	1440	2501	2109
28	283	1249	3248	1314	2398	2219	73	755	1160	3327	1397	2491	2195	143	1488	1147	3409	1330	2354	2172
29	293	1206	3139	1371	2464	2185	74	765	1201	3315	1352	2425	2186	144	1499	1176	3376	1442	2474	2229
30	304	1191	3181	1381	2381	2155	75	776	1198	3298	1293	2486	2146	145	1509	1184	3326	1431	2431	2144
31	314	1210	3175	1341	2465	2113	76	786	1195	3147	1318	2410	2203	146	1520	1207	3360	1378	2409	2030
32	325	1181	3048	1446	2416	2180	77	796	1208	3219	1351	2421	2218	147	1530	1234	3275	1367	2426	2197
33	335	1155	3304	1460	2398	2174	78	807	1268	3194	1351	2355	2093	148	1541	1228	3300	1344	2321	2229
34	346	1224	3156	1405	2466	2211	79	817	1173	3302	1365	2463	2184	149	1551	1262	3286	1350	2411	2101
35	356	1229	3105	1392	2418	2216	80	828	1212	3302	1306	2488	2107	150	1562	1160	3391	1362	2484	2153
36	367	1182	3249	1343	2414	2132	81	838	1163	3237	1379	2465	2164							
37	377	1203	3249	1411	2429	2127	82	849	1192	3288	1419	2355	2117							
38	388	1212	3210	1362	2451	2110	83	859	1176	3406	1302	2370	2121							
39	398	1231	3199	1410	2477	2162	84	870	1195	3136	1329	2367	2157							
40	409	1182	3309	1331	2410	2220	85	880	1189	3263	1378	2504	2112							
41	419	1202	3133	1436	2471	2172	86	891	1184	3242	1246	2414	2196							
42	430	1201	3247	1370	2452	2201	87	901	1180	3349	1335	2380	2140							
43	440	1184	3380	1361	2489	2200	88	912	1191	3348	1282	2493	2103							
44	451	1185	3303	1410	2455	2204	115	1195	1135	3249	1444	2473	2213							
45	461	1216	3223	1383	2502	2309	116	1205	1260	3389	1418	2446	2157							

Table 3.18a: Composition of Garnet II from sample 288 as analyzed along traverse A-B (Plate 7.7). Distance refers to the distance from starting point A in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
1	0	32.42	5.04	2.88	1.44	21.95	37.11	0.17	100.85	2.25	0.58	0.22	0.11	1.97	2.94	0.00	8.07	0.71	0.18	0.07	0.03	0.80	0.20
2	26	34.11	4.92	2.58	1.64	21.25	37.34	0.01	101.84	2.20	0.61	0.22	0.10	2.01	2.94	0.00	8.06	0.71	0.19	0.07	0.03	0.78	0.22
5	105	33.50	5.08	2.57	1.48	21.46	37.67	0.03	101.76	2.20	0.61	0.20	0.10	2.00	2.95	0.00	8.05	0.71	0.20	0.06	0.03	0.78	0.22
6	131	33.80	5.27	2.41	1.44	21.73	37.84	0.08	102.51	2.18	0.64	0.21	0.09	2.00	2.95	0.00	8.05	0.70	0.20	0.07	0.03	0.77	0.23
7	157	33.25	5.45	2.52	1.28	21.66	37.67	0.00	101.83	2.16	0.63	0.21	0.10	2.00	2.94	0.00	8.06	0.69	0.20	0.07	0.03	0.77	0.23
8	183	33.14	5.44	2.55	1.58	21.78	37.65	0.00	102.14	2.17	0.65	0.20	0.10	1.99	2.95	0.00	8.06	0.70	0.21	0.06	0.03	0.77	0.23
9	210	33.40	5.58	2.41	1.55	21.69	37.89	0.00	102.52	2.17	0.67	0.21	0.09	1.99	2.94	0.00	8.07	0.69	0.21	0.07	0.03	0.77	0.23
10	236	33.08	5.69	2.50	1.36	21.55	37.40	0.07	101.58	1.75	0.56	0.13	0.07	2.53	2.81	0.00	8.00	0.70	0.22	0.05	0.03	0.76	0.24
12	288	33.38	5.74	2.25	1.47	21.77	37.72	0.03	102.33	2.17	0.67	0.19	0.10	1.98	2.95	0.00	8.06	0.70	0.21	0.06	0.03	0.77	0.23
13	314	33.14	5.70	2.26	1.44	21.51	37.74	0.06	101.79	2.15	0.70	0.20	0.10	2.00	2.93	0.01	8.07	0.68	0.22	0.06	0.03	0.75	0.25
14	341	32.96	6.04	2.34	1.49	21.76	37.62	0.11	102.22	2.15	0.70	0.19	0.09	2.00	2.93	0.00	8.07	0.69	0.22	0.06	0.03	0.76	0.24
15	367	32.77	5.94	2.29	1.42	21.58	37.34	0.00	101.35	2.09	0.66	0.19	0.10	2.03	2.96	0.00	8.02	0.69	0.22	0.06	0.03	0.76	0.24
17	419	32.75	6.05	2.34	1.33	21.85	38.18	0.00	102.50	2.17	0.68	0.19	0.09	2.00	2.93	0.00	8.07	0.69	0.22	0.06	0.03	0.76	0.24
18	445	32.87	5.78	2.30	1.34	21.53	37.18	0.00	101.00	2.13	0.70	0.20	0.10	1.98	2.95	0.00	8.06	0.68	0.22	0.06	0.03	0.75	0.25
19	472	32.63	5.99	2.43	1.49	21.52	37.68	0.06	101.73	2.13	0.70	0.19	0.08	2.00	2.94	0.00	8.06	0.69	0.23	0.06	0.03	0.75	0.25
20	498	32.95	6.10	2.32	1.26	21.95	37.97	0.00	102.54	2.11	0.68	0.20	0.10	2.00	2.96	0.00	8.04	0.68	0.22	0.06	0.03	0.76	0.24
21	524	32.60	5.89	2.37	1.48	21.88	38.19	0.07	102.41	2.12	0.71	0.19	0.09	2.02	2.93	0.01	8.06	0.68	0.23	0.06	0.03	0.75	0.25
22	550	32.56	6.15	2.26	1.42	22.11	37.70	0.09	102.19	2.11	0.73	0.19	0.09	1.99	2.95	0.00	8.06	0.68	0.23	0.06	0.03	0.74	0.26
23	576	32.81	6.36	2.28	1.40	22.00	38.30	0.00	103.15	2.12	0.71	0.19	0.09	2.01	2.94	0.00	8.06	0.68	0.23	0.06	0.03	0.75	0.25
24	603	32.63	6.08	2.26	1.35	21.90	37.76	0.07	101.98	2.10	0.70	0.19	0.09	2.02	2.94	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
25	629	31.73	5.97	2.23	1.35	21.73	37.29	0.00	100.31	2.11	0.70	0.17	0.08	2.01	2.96	0.00	8.04	0.69	0.23	0.06	0.03	0.75	0.25
26	655	32.08	5.94	2.06	1.21	21.65	37.59	0.01	100.53	2.10	0.74	0.19	0.09	1.98	2.96	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
27	681	32.50	6.44	2.25	1.43	21.81	38.35	0.00	102.78	2.10	0.74	0.17	0.10	1.99	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
31	786	32.21	6.41	2.14	1.44	21.76	38.08	0.04	102.03	2.08	0.74	0.18	0.09	2.01	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
32	812	32.27	6.44	2.12	1.39	22.11	38.18	0.08	102.51	2.09	0.75	0.17	0.09	1.98	2.96	0.00	8.04	0.67	0.24	0.06	0.03	0.74	0.26
33	838	32.43	6.51	2.07	1.35	21.83	38.46	0.00	102.64	2.09	0.76	0.16	0.08	2.00	2.95	0.00	8.05	0.67	0.25	0.05	0.03	0.73	0.27
35	891	32.28	6.37	2.12	1.40	21.47	37.70	0.00	101.34	2.09	0.76	0.17	0.09	1.99	2.96	0.01	8.05	0.67	0.25	0.05	0.03	0.73	0.27
36	917	32.34	6.61	2.01	1.37	21.87	38.36	0.09	102.57	2.11	0.77	0.17	0.09	1.98	2.95	0.00	8.06	0.67	0.25	0.05	0.03	0.73	0.27

37	943	32.58	6.67	1.99	1.31	21.69	38.09	0.05	102.33	2.10	0.75	0.18	0.08	2.01	2.94	0.00	8.05	0.68	0.24	0.06	0.02	0.74	0.26
39	996	34.44	4.65	2.10	1.76	21.73	37.53	0.09	102.20	2.11	0.74	0.18	0.08	2.00	2.94	0.00	8.06	0.68	0.24	0.06	0.03	0.74	0.26
40	1022	32.57	6.40	2.20	1.26	21.87	37.93	0.01	102.23	2.08	0.76	0.18	0.08	2.00	2.94	0.01	8.06	0.67	0.25	0.06	0.03	0.73	0.27
41	1048	31.93	6.57	2.20	1.22	21.78	37.70	0.12	101.40	2.08	0.76	0.18	0.09	1.99	2.95	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
42	1074	31.84	6.54	2.10	1.39	21.66	37.73	0.00	101.26	2.09	0.74	0.16	0.08	2.01	2.95	0.00	8.04	0.68	0.24	0.05	0.03	0.74	0.26
43	1100	32.44	6.47	1.92	1.29	22.07	38.26	0.00	102.44	2.11	0.77	0.17	0.07	1.98	2.95	0.00	8.06	0.67	0.25	0.05	0.02	0.73	0.27
45	1153	32.25	6.54	2.04	1.38	21.42	37.59	0.00	101.24	2.07	0.76	0.16	0.09	2.01	2.95	0.00	8.05	0.67	0.25	0.05	0.03	0.73	0.27
46	1179	32.17	6.66	1.93	1.37	22.19	38.26	0.00	102.57	2.06	0.77	0.18	0.08	2.02	2.94	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
47	1205	31.81	6.67	2.17	1.20	22.08	37.98	0.00	101.91	2.08	0.76	0.17	0.09	2.00	2.95	0.00	8.05	0.67	0.25	0.05	0.03	0.73	0.27
48	1231	32.02	6.59	2.00	1.34	21.89	38.01	0.00	101.85	2.09	0.73	0.18	0.10	1.99	2.96	0.00	8.04	0.67	0.24	0.06	0.03	0.74	0.26
49	1258	31.87	6.29	2.09	1.46	21.58	37.78	0.04	101.07	2.07	0.79	0.17	0.09	1.99	2.95	0.00	8.06	0.66	0.25	0.05	0.03	0.72	0.28
50	1284	32.12	6.88	2.07	1.40	21.88	38.32	0.08	102.66	2.10	0.75	0.17	0.08	1.99	2.96	0.00	8.04	0.68	0.24	0.05	0.03	0.74	0.26
51	1310	32.13	6.40	1.97	1.19	21.58	37.87	0.02	101.15	2.10	0.75	0.17	0.08	1.99	2.95	0.00	8.05	0.68	0.24	0.06	0.03	0.74	0.26
52	1336	32.26	6.48	2.06	1.21	21.69	37.91	0.00	101.61	2.12	0.78	0.17	0.09	1.96	2.95	0.00	8.07	0.67	0.25	0.05	0.03	0.73	0.27
53	1362	32.37	6.65	2.04	1.33	21.21	37.69	0.03	101.29	2.11	0.77	0.17	0.09	1.97	2.95	0.00	8.06	0.67	0.25	0.05	0.03	0.73	0.27
54	1389	32.70	6.69	2.03	1.39	21.64	38.16	0.00	102.61	2.12	0.78	0.16	0.08	1.99	2.94	0.00	8.07	0.68	0.25	0.05	0.02	0.73	0.27
57	1467	32.04	6.68	1.94	1.23	21.67	37.77	0.00	101.31	2.06	0.73	0.18	0.10	1.99	2.97	0.00	8.03	0.67	0.24	0.06	0.03	0.74	0.26
58	1493	31.70	6.27	2.13	1.52	21.68	38.21	0.01	101.50	2.09	0.75	0.17	0.10	1.98	2.96	0.00	8.05	0.67	0.24	0.05	0.03	0.74	0.26
59	1520	32.31	6.47	2.04	1.49	21.69	38.25	0.04	102.25	2.11	0.75	0.17	0.09	2.01	2.94	0.01	8.06	0.68	0.24	0.06	0.03	0.74	0.26
60	1546	32.43	6.49	2.07	1.31	21.95	37.83	0.12	102.09	2.10	0.75	0.18	0.09	1.99	2.95	0.00	8.06	0.67	0.24	0.06	0.03	0.74	0.26
61	1572	32.06	6.45	2.10	1.30	21.48	37.64	0.08	101.03	2.10	0.76	0.17	0.08	1.99	2.95	0.00	8.05	0.68	0.24	0.06	0.02	0.73	0.27
62	1598	32.11	6.51	2.07	1.15	21.69	37.86	0.07	101.40	2.09	0.77	0.17	0.09	2.01	2.94	0.00	8.06	0.67	0.25	0.05	0.03	0.73	0.27
63	1624	32.34	6.64	2.03	1.30	21.99	37.98	0.00	102.28	2.08	0.79	0.18	0.09	1.99	2.94	0.00	8.07	0.66	0.25	0.06	0.03	0.72	0.28
64	1651	32.17	6.86	2.15	1.42	21.84	38.10	0.00	102.53	2.10	0.74	0.17	0.08	1.99	2.96	0.00	8.04	0.68	0.24	0.06	0.02	0.74	0.26
65	1677	32.39	6.41	2.08	1.17	21.75	38.13	0.00	101.93	2.09	0.75	0.17	0.09	1.99	2.96	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
66	1703	32.29	6.51	2.07	1.39	21.83	38.26	0.00	102.35	2.08	0.76	0.18	0.08	1.99	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
67	1729	32.24	6.58	2.15	1.29	21.90	38.25	0.02	102.40	2.11	0.76	0.17	0.09	2.00	2.93	0.00	8.07	0.67	0.24	0.06	0.03	0.73	0.27
68	1755	32.23	6.54	2.07	1.38	21.73	37.50	0.00	101.45	2.10	0.77	0.18	0.08	1.99	2.94	0.00	8.06	0.67	0.24	0.06	0.03	0.73	0.27
70	1808	32.23	6.24	2.15	1.23	21.71	37.82	0.00	101.37	2.09	0.77	0.17	0.09	2.00	2.94	0.00	8.06	0.67	0.25	0.05	0.03	0.73	0.27
71	1834	31.96	6.57	2.02	1.29	21.72	37.65	0.00	101.21	2.09	0.72	0.17	0.10	2.01	2.95	0.00	8.04	0.68	0.24	0.05	0.03	0.74	0.26
72	1860	31.74	6.17	1.98	1.49	21.72	37.49	0.07	100.58	2.12	0.74	0.17	0.09	1.98	2.96	0.01	8.05	0.68	0.24	0.06	0.03	0.74	0.26
73	1886	32.17	6.28	2.05	1.32	21.41	37.61	0.11	100.84	2.09	0.74	0.18	0.10	2.01	2.94	0.00	8.06	0.67	0.24	0.06	0.03	0.74	0.26
74	1913	32.00	6.32	2.20	1.46	21.76	37.56	0.00	101.31	2.09	0.73	0.18	0.08	2.02	2.94	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
76	1965	32.06	6.34	2.01	1.20	21.66	37.88	0.00	101.15	2.08	0.74	0.18	0.09	2.01	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26

77	1991	31.69	6.35	2.16	1.37	21.72	37.64	0.05	100.93	2.09	0.75	0.18	0.08	1.99	2.96	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
78	2017	32.47	6.51	2.12	1.19	21.89	38.46	0.00	102.64	2.11	0.73	0.19	0.09	2.01	2.93	0.00	8.06	0.68	0.24	0.06	0.03	0.74	0.26
79	2044	32.14	6.27	2.28	1.30	21.81	37.41	0.00	101.21	2.07	0.76	0.17	0.08	2.02	2.94	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
80	2070	31.49	6.48	2.05	1.27	21.82	37.49	0.00	100.61	2.11	0.73	0.18	0.10	1.99	2.95	0.00	8.06	0.68	0.23	0.06	0.03	0.74	0.26
81	2096	32.32	6.25	2.19	1.48	21.57	37.64	0.03	101.45	2.11	0.75	0.18	0.09	2.00	2.93	0.01	8.07	0.67	0.24	0.06	0.03	0.74	0.26
82	2122	32.33	6.42	2.18	1.42	21.75	37.47	0.09	101.57	2.09	0.73	0.18	0.09	2.00	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
83	2148	32.24	6.35	2.18	1.42	21.86	38.02	0.01	102.08	2.11	0.73	0.18	0.09	2.00	2.95	0.00	8.05	0.68	0.23	0.06	0.03	0.74	0.26
84	2175	32.55	6.28	2.16	1.31	21.91	38.07	0.00	102.29	2.10	0.71	0.18	0.09	2.00	2.95	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
85	2201	32.32	6.17	2.17	1.43	21.91	38.09	0.00	102.08	2.10	0.74	0.17	0.10	2.00	2.95	0.00	8.06	0.67	0.24	0.06	0.03	0.74	0.26
86	2227	32.31	6.43	2.09	1.45	21.82	37.93	0.06	102.02	2.14	0.73	0.17	0.09	1.99	2.95	0.00	8.06	0.68	0.23	0.06	0.03	0.75	0.25
87	2253	32.90	6.31	2.08	1.34	21.69	37.93	0.01	102.25	2.08	0.74	0.17	0.09	2.00	2.95	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
88	2279	32.05	6.41	2.05	1.30	21.87	38.00	0.00	101.68	2.10	0.73	0.18	0.10	2.00	2.95	0.00	8.05	0.68	0.24	0.06	0.03	0.74	0.26
90	2332	33.23	5.26	2.06	1.46	21.89	37.74	0.00	101.65	2.11	0.73	0.18	0.10	1.99	2.94	0.00	8.06	0.67	0.23	0.06	0.03	0.74	0.26
91	2358	32.37	6.31	2.16	1.56	21.72	37.82	0.02	101.94	2.09	0.72	0.17	0.09	1.99	2.96	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
92	2384	31.97	6.21	2.08	1.33	21.61	37.83	0.00	101.01	2.11	0.73	0.18	0.10	2.01	2.93	0.00	8.06	0.68	0.23	0.06	0.03	0.74	0.26
94	2437	32.67	6.10	2.28	1.27	21.62	37.70	0.00	101.65	2.13	0.69	0.19	0.09	1.99	2.96	0.01	8.05	0.69	0.22	0.06	0.03	0.75	0.25
95	2463	32.45	5.91	2.30	1.29	21.47	37.68	0.10	101.10	2.10	0.70	0.19	0.10	2.00	2.96	0.00	8.05	0.68	0.23	0.06	0.03	0.75	0.25
96	2489	32.34	6.07	2.27	1.44	21.79	38.00	0.00	101.90	2.15	0.69	0.20	0.10	1.97	2.96	0.00	8.06	0.69	0.22	0.06	0.03	0.76	0.24
97	2515	32.57	5.84	2.33	1.46	21.21	37.46	0.00	100.86	2.16	0.69	0.19	0.09	2.00	2.93	0.00	8.07	0.69	0.22	0.06	0.03	0.76	0.24
98	2541	33.31	6.02	2.29	1.37	21.91	37.90	0.00	102.80	2.13	0.69	0.19	0.09	2.00	2.95	0.00	8.05	0.69	0.22	0.06	0.03	0.75	0.25
99	2568	32.20	5.88	2.30	1.33	21.47	37.38	0.00	100.55	2.12	0.68	0.21	0.09	1.99	2.95	0.00	8.05	0.68	0.22	0.07	0.03	0.76	0.24

Table 3.18.b: Qualitative trace element analysis of Garnet II from sample 288 along traverse A-B (Plate 7.7). Relative concentrations are measured in counts\second. **D** = distance from starting point A in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P	#	**D**	Ti	Cr	Y	Sc	P
1	0	1255	2555	1641	1124	2270	48	1231	1195	2437	1588	1077	2253	94	2437	1281	2632	1602	1155	2361
2	26	1092	2189	1341	992	1961	49	1258	1223	2643	1639	1086	2264	95	2463	1205	2577	1549	1026	2380
3	52	1199	2522	1775	1062	2833	50	1284	1221	2524	1553	1071	2216	96	2489	1216	2517	1601	1136	2216
4	79	1230	2537	1554	1194	2461	51	1310	1180	2472	1584	1097	2289	97	2515	1165	2533	1619	1102	2294
5	105	1178	2556	1575	1108	2418	52	1336	1250	2620	1527	1030	2262	98	2541	1228	2555	1546	1127	2312
7	157	1241	2660	1549	1046	2454	53	1362	1266	2501	1563	1023	2242	99	2568	1254	2575	1679	1143	2165
8	183	1197	2708	1595	1098	2359	54	1389	1204	2541	1519	1039	2388	100	2594	1236	2647	1598	1162	2180
9	210	1198	2522	1617	1133	2386	55	1415	1244	2569	1519	1019	2317							
10	236	1200	2574	1584	1124	2360	56	1441	1231	2458	1623	1048	2370							
11	262	1259	2523	1551	1113	2223	57	1467	1205	2578	1572	1010	2363							
12	288	1222	2607	1654	1122	2211	58	1493	1238	2520	1501	1041	2366							
13	314	1216	2524	1593	1088	2133	59	1520	1300	2512	1539	1082	2316							
14	341	1231	2538	1555	1193	2136	61	1572	1252	2468	1572	1097	2288							
15	367	1256	2472	1544	1069	2296	62	1598	1306	2582	1598	1069	2340							
16	393	1231	2522	1597	1101	2274	63	1624	1258	2498	1561	1119	2274							
17	419	1197	2488	1547	1086	2398	64	1651	1279	2471	1558	1117	2319							
18	445	1232	2563	1627	1079	2336	65	1677	1191	2604	1595	1087	2199							
19	472	1226	2453	1555	1074	2287	66	1703	1210	2525	1594	1088	2171							
20	498	1227	2552	1565	1079	2150	67	1729	1217	2497	1568	1054	2189							
21	524	1171	2479	1592	1095	2183	68	1755	1234	2672	1581	1106	2205							
22	550	1192	2464	1567	1093	2204	69	1782	1205	2560	1601	1081	2286							
23	576	1224	2500	1562	1087	2304	70	1808	1229	2558	1539	1092	2223							
24	603	1197	2521	1560	1013	2391	71	1834	1173	2500	1537	1029	2143							
25	629	1216	2452	1610	1098	2257	72	1860	1213	2499	1524	1020	2325							
26	655	1226	2485	1543	1088	2330	73	1886	1201	2595	1602	1110	2373							
27	681	1048	2138	1186	1018	1918	74	1913	1154	2582	1572	1037	2279							
28	707	1147	2442	1508	1112	2243	75	1939	1211	2554	1640	1101	2236							
29	734	1179	2534	1600	1088	2360	76	1965	1160	2594	1543	1061	2392							
30	760	1183	2474	1573	1087	2311	77	1991	1128	2515	1597	937	2324							
31	786	1151	2515	1528	1082	2258	78	2017	1203	2524	1559	1140	2217							
32	812	1219	2510	1513	1031	2301	79	2044	1287	2625	1566	1068	2247							
33	838	1256	2527	1642	1070	2301	80	2070	1167	2513	1553	1074	2383							
34	865	1186	2609	1566	1061	2238	81	2096	1243	2575	1457	1035	2407							
35	891	1151	2459	1423	1078	2222	82	2122	1228	2533	1577	1034	2410							
37	943	1191	2482	1607	1138	2336	83	2148	1238	2583	1529	1087	2275							
38	969	1202	2460	1545	995	2277	84	2175	1160	2608	1559	1089	2291							
39	996	1220	2670	1506	1092	2284	85	2201	1199	2546	1544	1102	2231							
40	1022	1245	2583	1553	1104	2312	86	2227	1214	2595	1552	1080	2266							
41	1048	1201	2549	1518	1037	2208	87	2253	1204	2545	1615	1114	2298							
42	1074	1237	2516	1526	1099	2180	88	2279	1272	2563	1590	1060	2361							
43	1100	1260	2417	1569	1119	2294	89	2306	1239	2530	1481	1123	2270							
44	1127	1180	2458	1484	1146	2320	90	2332	1168	2588	1546	1078	2407							
45	1153	1226	2467	1274	1055	1739	91	2358	1160	2647	1551	1074	2254							
46	1179	1229	2601	1559	1073	2131	92	2384	1188	2512	1607	1051	2239							
47	1205	1201	2580	1597	1103	2229	93	2410	1176	2538	1553	1111	2341							

Table 3.19a: Composition of Garnet II from sample 288 as analyzed along traverse C-D (Plate 7.7). Distance refers to the distance from starting point C in microns. Analyses with unacceptable totals due to the presence of inclusions have been omitted.

		Oxide percentage								Cations on a 12 (O) basis								Molar fraction					
#	Distance	FeO	MgO	CaO	MnO	Al_2O_3	SiO_2	TiO_2	Total	Fe	Mg	Ca	Mn	Al	Si	Ti	Total	X_{Alm}	X_{Prp}	X_{Grs}	X_{Sps}	X_{Fe}	X_{Mg}
2	17	33.30	4.63	2.26	1.70	21.38	37.22	0.08	100.49	2.22	0.55	0.19	0.11	2.00	2.96	0.00	8.04	0.72	0.18	0.06	0.04	0.80	0.20
3	33	32.73	4.52	2.62	1.46	21.34	37.64	0.11	100.31	2.17	0.53	0.22	0.10	2.00	2.99	0.01	8.01	0.72	0.18	0.07	0.03	0.80	0.20
4	50	33.05	4.73	2.52	1.46	21.64	38.12	0.00	101.51	2.17	0.55	0.21	0.10	2.00	2.99	0.00	8.01	0.72	0.18	0.07	0.03	0.80	0.20
5	67	32.65	5.66	2.44	1.30	21.86	37.83	0.00	101.73	2.13	0.66	0.20	0.09	2.01	2.95	0.00	8.04	0.69	0.21	0.07	0.03	0.76	0.24
6	83	31.75	5.55	2.37	1.39	21.80	38.08	0.00	100.94	2.08	0.65	0.20	0.09	2.01	2.98	0.00	8.01	0.69	0.21	0.07	0.03	0.76	0.24
7	100	32.37	5.77	2.30	1.57	21.82	37.85	0.01	101.67	2.11	0.67	0.19	0.10	2.01	2.95	0.00	8.04	0.69	0.22	0.06	0.03	0.76	0.24
8	117	31.92	5.53	2.39	1.35	21.66	37.91	0.00	100.77	2.10	0.65	0.20	0.09	2.01	2.98	0.00	8.02	0.69	0.21	0.07	0.03	0.76	0.24
9	133	31.63	5.82	2.22	1.30	21.47	37.48	0.07	99.93	2.09	0.69	0.19	0.09	2.00	2.97	0.00	8.03	0.69	0.22	0.06	0.03	0.75	0.25
10	150	31.81	6.02	2.32	1.47	21.72	37.64	0.03	100.96	2.09	0.70	0.19	0.10	2.01	2.95	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
11	167	31.94	5.99	2.31	1.24	21.54	37.86	0.07	100.88	2.10	0.70	0.19	0.08	1.99	2.97	0.00	8.03	0.68	0.23	0.06	0.03	0.75	0.25
12	183	31.85	6.01	2.33	1.44	21.81	38.33	0.00	102.05	2.06	0.69	0.19	0.09	1.99	2.97	0.00	8.05	0.68	0.23	0.06	0.03	0.75	0.25
13	200	31.36	6.19	2.13	1.39	21.69	38.04	0.02	100.81	2.05	0.72	0.18	0.09	2.00	2.98	0.00	8.02	0.67	0.24	0.06	0.03	0.74	0.26
14	216	31.83	6.22	2.19	1.31	21.85	37.78	0.00	101.19	2.08	0.72	0.18	0.09	2.01	2.95	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
15	233	31.93	6.08	2.22	1.38	21.82	38.22	0.06	101.65	2.08	0.70	0.19	0.09	2.00	2.97	0.00	8.03	0.68	0.23	0.06	0.03	0.75	0.25
16	250	31.81	6.15	2.09	1.47	21.87	37.79	0.05	101.17	2.08	0.72	0.18	0.10	2.02	2.95	0.00	8.04	0.68	0.23	0.06	0.03	0.74	0.26
17	266	31.49	6.32	2.11	1.30	21.86	38.31	0.02	101.39	2.05	0.73	0.18	0.09	2.00	2.98	0.00	8.02	0.67	0.24	0.06	0.03	0.74	0.26
18	283	31.69	6.27	2.12	1.04	21.94	37.98	0.00	101.04	2.07	0.73	0.18	0.07	2.02	2.96	0.00	8.03	0.68	0.24	0.06	0.02	0.74	0.26
19	300	31.21	6.50	1.93	1.45	21.82	38.02	0.00	100.94	2.04	0.76	0.16	0.10	2.01	2.97	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
20	316	31.13	6.24	2.16	1.41	21.77	37.84	0.11	100.54	2.04	0.73	0.18	0.09	2.01	2.97	0.01	8.03	0.67	0.24	0.06	0.03	0.74	0.26
21	333	31.67	6.33	2.11	1.25	21.87	38.09	0.00	101.33	2.06	0.74	0.18	0.08	2.01	2.97	0.00	8.03	0.67	0.24	0.06	0.03	0.74	0.26
22	350	31.59	6.32	2.06	1.25	21.49	37.51	0.00	100.21	2.08	0.74	0.17	0.08	2.00	2.96	0.00	8.04	0.68	0.24	0.06	0.03	0.74	0.26
23	366	31.99	6.66	1.99	1.23	22.08	38.16	0.01	102.11	2.07	0.77	0.16	0.08	2.01	2.95	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
24	383	31.70	6.33	2.04	1.50	21.88	38.06	0.17	101.51	2.06	0.73	0.17	0.10	2.01	2.96	0.01	8.03	0.67	0.24	0.06	0.03	0.74	0.26
25	400	31.45	6.45	2.02	1.27	21.73	37.59	0.07	100.52	2.07	0.75	0.17	0.08	2.01	2.95	0.00	8.04	0.67	0.25	0.06	0.03	0.73	0.27
26	416	31.63	6.53	1.87	1.41	21.55	37.41	0.00	100.40	2.08	0.77	0.16	0.09	2.00	2.95	0.00	8.05	0.67	0.25	0.05	0.03	0.73	0.27
27	433	31.62	6.26	2.14	1.52	22.13	38.41	0.00	102.08	2.04	0.72	0.18	0.10	2.02	2.97	0.00	8.02	0.67	0.24	0.06	0.03	0.74	0.26
28	450	31.66	6.41	2.12	1.44	21.82	38.09	0.00	101.54	2.06	0.74	0.18	0.10	2.00	2.96	0.00	8.04	0.67	0.24	0.06	0.03	0.73	0.27
29	466	31.57	6.54	2.04	1.46	22.02	37.48	0.01	101.11	2.06	0.76	0.17	0.10	2.03	2.93	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27

30	483	31.94	6.49	2.06	1.30	21.86	38.17	0.00	101.81	2.07	0.75	0.17	0.09	2.00	2.96	0.00	8.04	0.67	0.24	0.06	0.03	0.73	0.27
31	500	31.88	6.49	2.02	1.33	21.79	38.07	0.00	101.57	2.07	0.75	0.17	0.09	2.00	2.96	0.00	8.04	0.67	0.24	0.05	0.03	0.73	0.27
32	516	31.38	6.58	2.02	1.40	21.95	37.71	0.09	101.04	2.05	0.77	0.17	0.09	2.02	2.95	0.01	8.04	0.67	0.25	0.05	0.03	0.73	0.27
33	533	31.37	6.58	1.98	1.32	22.25	38.47	0.02	101.97	2.02	0.76	0.16	0.09	2.02	2.97	0.00	8.02	0.67	0.25	0.05	0.03	0.73	0.27
34	549	31.13	6.43	1.98	1.45	21.80	37.83	0.00	100.63	2.04	0.75	0.17	0.10	2.01	2.96	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
35	566	31.31	6.54	1.97	1.17	21.33	38.15	0.00	100.48	2.05	0.76	0.17	0.08	1.97	2.99	0.00	8.02	0.67	0.25	0.05	0.03	0.73	0.27
36	583	31.53	6.55	1.94	1.40	21.88	37.93	0.13	101.24	2.06	0.76	0.16	0.09	2.01	2.96	0.01	8.04	0.67	0.25	0.05	0.03	0.73	0.27
37	599	31.38	6.77	2.01	1.37	22.01	38.22	0.00	101.77	2.03	0.78	0.17	0.09	2.01	2.96	0.00	8.04	0.66	0.25	0.05	0.03	0.72	0.28
38	616	31.47	6.31	2.00	1.31	21.35	37.70	0.00	100.14	2.08	0.74	0.17	0.09	1.98	2.97	0.00	8.03	0.68	0.24	0.05	0.03	0.74	0.26
39	633	31.51	6.38	1.96	1.18	21.46	37.65	0.04	100.14	2.08	0.75	0.17	0.08	1.99	2.97	0.00	8.03	0.68	0.24	0.05	0.03	0.73	0.27
40	649	31.23	6.62	1.98	1.45	21.66	37.86	0.05	100.80	2.04	0.77	0.17	0.10	2.00	2.96	0.00	8.04	0.66	0.25	0.05	0.03	0.73	0.27
41	666	31.60	6.47	2.08	1.34	21.83	37.56	0.00	100.87	2.07	0.76	0.17	0.09	2.02	2.94	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
42	683	31.08	6.63	1.90	1.35	22.17	38.17	0.08	101.30	2.02	0.77	0.16	0.09	2.03	2.96	0.00	8.02	0.67	0.25	0.05	0.03	0.72	0.28
43	699	31.43	6.76	2.06	1.44	22.08	38.17	0.02	101.94	2.03	0.78	0.17	0.09	2.01	2.95	0.00	8.04	0.66	0.25	0.06	0.03	0.72	0.28
44	716	31.68	6.51	1.90	1.21	21.69	37.86	0.00	100.85	2.07	0.76	0.16	0.08	2.00	2.96	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
45	733	31.45	6.59	1.92	1.11	21.99	37.83	0.01	100.89	2.05	0.77	0.16	0.07	2.02	2.95	0.00	8.03	0.67	0.25	0.05	0.02	0.73	0.27
46	749	32.10	6.62	1.82	1.21	21.92	38.32	0.00	101.99	2.08	0.76	0.15	0.08	2.00	2.97	0.00	8.04	0.68	0.25	0.05	0.03	0.73	0.27
47	766	31.30	6.43	1.99	1.22	21.77	37.65	0.06	100.37	2.06	0.75	0.17	0.08	2.02	2.96	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
48	783	31.53	6.47	2.04	1.34	21.89	37.83	0.00	101.11	2.06	0.75	0.17	0.09	2.01	2.95	0.00	8.04	0.67	0.25	0.06	0.03	0.73	0.27
49	799	31.83	6.83	1.97	1.33	22.31	38.16	0.00	102.43	2.05	0.78	0.16	0.09	2.03	2.94	0.00	8.05	0.66	0.25	0.05	0.03	0.72	0.28
50	816	31.23	6.43	2.06	1.38	21.52	37.72	0.08	100.33	2.05	0.75	0.17	0.09	2.00	2.97	0.00	8.04	0.67	0.25	0.06	0.03	0.73	0.27
51	833	31.39	6.61	1.98	1.39	22.01	38.24	0.08	101.62	2.04	0.76	0.16	0.09	2.01	2.96	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
52	849	31.04	6.87	1.98	1.19	21.75	37.67	0.03	100.49	2.03	0.80	0.17	0.08	2.01	2.95	0.00	8.04	0.66	0.26	0.05	0.03	0.72	0.28
53	866	31.59	6.59	1.89	1.16	21.84	37.75	0.03	100.82	2.07	0.77	0.16	0.08	2.01	2.95	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
54	882	31.26	6.57	1.94	1.13	21.64	37.86	0.00	100.40	2.05	0.77	0.16	0.08	2.00	2.97	0.00	8.03	0.67	0.25	0.05	0.02	0.73	0.27
55	899	31.22	6.46	2.01	1.33	21.74	37.59	0.14	100.35	2.05	0.76	0.17	0.09	2.01	2.95	0.01	8.04	0.67	0.25	0.06	0.03	0.73	0.27
56	916	31.24	6.61	1.95	1.49	21.72	37.89	0.01	100.90	2.04	0.77	0.16	0.10	2.00	2.96	0.00	8.04	0.66	0.25	0.05	0.03	0.73	0.27
57	932	31.84	6.70	1.97	1.44	21.91	38.63	0.00	102.49	2.05	0.77	0.16	0.09	1.99	2.97	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
58	949	31.37	6.50	2.01	1.44	21.82	38.13	0.08	101.27	2.04	0.75	0.17	0.10	2.00	2.97	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
59	966	31.83	6.69	1.92	1.35	21.79	37.92	0.03	101.50	2.07	0.78	0.16	0.09	2.00	2.95	0.00	8.05	0.67	0.25	0.05	0.03	0.73	0.27
60	982	31.50	6.61	1.95	1.34	21.92	38.02	0.00	101.35	2.05	0.77	0.16	0.09	2.01	2.96	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
61	999	31.65	6.78	1.96	1.35	22.00	38.54	0.00	102.29	2.04	0.78	0.16	0.09	2.00	2.97	0.00	8.03	0.66	0.25	0.05	0.03	0.72	0.28
62	1016	31.30	6.63	2.07	1.23	21.99	38.14	0.03	101.36	2.03	0.77	0.17	0.08	2.01	2.96	0.00	8.03	0.67	0.25	0.06	0.03	0.73	0.27
63	1032	31.48	6.81	1.93	1.22	21.90	38.21	0.05	101.55	2.04	0.79	0.16	0.08	2.00	2.96	0.00	8.04	0.67	0.26	0.05	0.03	0.72	0.28

64	1049	31.41	6.47	1.88	1.40	21.90	38.23	0.05	101.29	2.04	0.75	0.16	0.09	2.01	2.97	0.00	8.02	0.67	0.25	0.05	0.03	0.73	0.27
65	1066	31.26	6.63	1.99	1.32	21.69	37.96	0.00	100.86	2.04	0.77	0.17	0.09	2.00	2.97	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
66	1082	31.10	6.54	2.02	1.41	21.41	37.71	0.07	100.20	2.05	0.77	0.17	0.09	1.99	2.97	0.00	8.04	0.66	0.25	0.06	0.03	0.73	0.27
69	1132	30.99	6.35	2.08	1.32	21.67	38.03	0.04	100.44	2.03	0.74	0.17	0.09	2.00	2.98	0.00	8.02	0.67	0.24	0.06	0.03	0.73	0.27
70	1149	31.67	6.52	1.91	1.32	21.86	38.04	0.00	101.32	2.06	0.76	0.16	0.09	2.01	2.96	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
72	1182	31.79	6.56	2.10	1.15	21.73	38.53	0.00	101.86	2.06	0.76	0.17	0.08	1.98	2.98	0.00	8.03	0.67	0.25	0.06	0.02	0.73	0.27
73	1199	31.91	6.74	1.97	1.35	22.04	38.13	0.00	102.14	2.06	0.78	0.16	0.09	2.01	2.95	0.00	8.05	0.67	0.25	0.05	0.03	0.73	0.27
74	1215	31.29	6.41	1.91	1.32	21.46	37.69	0.00	100.08	2.06	0.75	0.16	0.09	1.99	2.97	0.00	8.03	0.67	0.25	0.05	0.03	0.73	0.27
75	1232	32.02	6.61	1.93	1.26	21.98	38.28	0.15	102.08	2.07	0.76	0.16	0.08	2.00	2.96	0.01	8.04	0.67	0.25	0.05	0.03	0.73	0.27
76	1249	31.62	6.69	2.00	1.39	22.01	38.11	0.04	101.83	2.05	0.77	0.17	0.09	2.01	2.95	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
77	1265	31.41	6.73	1.90	1.32	22.31	38.71	0.01	102.37	2.02	0.77	0.16	0.09	2.02	2.97	0.00	8.02	0.67	0.25	0.05	0.03	0.72	0.28
78	1282	30.94	6.72	1.83	1.28	21.59	37.74	0.00	100.11	2.04	0.79	0.15	0.09	2.00	2.97	0.00	8.03	0.66	0.26	0.05	0.03	0.72	0.28
80	1315	31.92	6.66	1.90	1.33	22.17	38.28	0.00	102.26	2.06	0.77	0.16	0.09	2.02	2.95	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
81	1332	31.61	6.77	1.96	1.20	21.75	38.12	0.01	101.41	2.06	0.79	0.16	0.08	1.99	2.96	0.00	8.04	0.67	0.25	0.05	0.03	0.72	0.28
84	1382	31.08	6.64	1.91	1.13	21.96	38.16	0.00	100.88	2.03	0.77	0.16	0.07	2.02	2.97	0.00	8.02	0.67	0.25	0.05	0.02	0.72	0.28
85	1399	31.69	6.80	2.14	1.38	21.96	37.85	0.03	101.82	2.06	0.79	0.18	0.09	2.01	2.94	0.00	8.06	0.66	0.25	0.06	0.03	0.72	0.28
86	1415	30.85	6.49	1.97	1.39	22.20	37.83	0.08	100.74	2.01	0.76	0.17	0.09	2.04	2.95	0.00	8.02	0.67	0.25	0.05	0.03	0.73	0.27
87	1432	30.82	6.34	1.99	1.43	21.60	37.50	0.13	99.69	2.04	0.75	0.17	0.10	2.01	2.97	0.01	8.03	0.67	0.25	0.06	0.03	0.73	0.27
88	1449	31.76	6.69	2.06	1.36	21.84	37.92	0.01	101.62	2.07	0.78	0.17	0.09	2.00	2.95	0.00	8.05	0.67	0.25	0.06	0.03	0.73	0.27
89	1465	30.94	6.61	2.00	1.36	21.59	37.94	0.02	100.44	2.03	0.77	0.17	0.09	2.00	2.97	0.00	8.03	0.66	0.25	0.06	0.03	0.72	0.28
90	1482	31.42	6.63	2.07	1.28	21.61	37.87	0.00	100.89	2.06	0.77	0.17	0.09	1.99	2.96	0.00	8.04	0.67	0.25	0.06	0.03	0.73	0.27
91	1499	31.74	6.40	1.94	1.45	21.58	38.21	0.00	101.32	2.07	0.74	0.16	0.10	1.98	2.98	0.00	8.03	0.67	0.24	0.05	0.03	0.74	0.26
92	1515	31.15	6.90	1.95	1.29	21.65	37.61	0.00	100.55	2.04	0.81	0.16	0.09	2.00	2.95	0.00	8.05	0.66	0.26	0.05	0.03	0.72	0.28
93	1532	31.51	6.43	2.00	1.32	21.72	38.18	0.06	101.16	2.05	0.75	0.17	0.09	2.00	2.98	0.00	8.03	0.67	0.24	0.05	0.03	0.73	0.27
94	1548	31.18	6.50	1.96	1.21	21.98	38.12	0.00	100.95	2.03	0.75	0.16	0.08	2.02	2.97	0.00	8.02	0.67	0.25	0.05	0.03	0.73	0.27
95	1565	30.98	6.65	2.05	1.30	21.77	38.15	0.00	100.90	2.02	0.77	0.17	0.09	2.00	2.97	0.00	8.03	0.66	0.25	0.06	0.03	0.72	0.28
96	1582	31.66	6.65	1.99	1.33	21.97	37.99	0.00	101.59	2.06	0.77	0.17	0.09	2.01	2.95	0.00	8.04	0.67	0.25	0.05	0.03	0.73	0.27
97	1598	31.35	6.45	1.93	1.33	21.39	37.99	0.11	100.44	2.06	0.76	0.16	0.09	1.98	2.98	0.01	8.03	0.67	0.25	0.05	0.03	0.73	0.27
98	1615	31.61	6.58	2.15	1.49	21.75	37.89	0.00	101.47	2.06	0.76	0.18	0.10	2.00	2.95	0.00	8.05	0.66	0.25	0.06	0.03	0.73	0.27
100	1648	31.30	6.46	2.00	1.18	21.79	37.97	0.09	100.70	2.05	0.75	0.17	0.08	2.01	2.97	0.01	8.03	0.67	0.25	0.05	0.03	0.73	0.27
101	1665	31.52	6.33	2.12	1.39	21.97	38.23	0.00	101.56	2.05	0.73	0.18	0.09	2.01	2.97	0.00	8.03	0.67	0.24	0.06	0.03	0.74	0.26
102	1682	31.07	6.23	2.03	1.19	21.70	38.20	0.06	100.42	2.04	0.73	0.17	0.08	2.00	2.99	0.00	8.01	0.68	0.24	0.06	0.03	0.74	0.26
103	1698	31.61	6.57	2.11	1.40	22.01	38.34	0.00	102.04	2.04	0.76	0.18	0.09	2.00	2.96	0.00	8.03	0.67	0.25	0.06	0.03	0.73	0.27
104	1715	31.46	6.35	2.00	1.41	21.61	37.55	0.00	100.38	2.07	0.75	0.17	0.09	2.01	2.96	0.00	8.04	0.67	0.24	0.05	0.03	0.74	0.26

105	1732	31.42	6.34	2.00	1.32	21.86	38.07	0.00	101.00	2.05	0.74	0.17	0.09	2.01	2.97	0.00	8.02	0.67	0.24	0.06	0.03	0.74	0.26
106	1748	31.33	6.28	2.05	1.32	21.64	37.91	0.00	100.52	2.06	0.73	0.17	0.09	2.00	2.97	0.00	8.03	0.67	0.24	0.06	0.03	0.74	0.26
107	1765	31.25	6.76	2.08	1.44	21.82	38.12	0.05	101.47	2.03	0.78	0.17	0.09	2.00	2.96	0.00	8.04	0.66	0.25	0.06	0.03	0.72	0.28
108	1782	31.77	6.63	2.14	1.46	22.05	38.36	0.04	102.40	2.05	0.76	0.18	0.10	2.00	2.96	0.00	8.04	0.66	0.25	0.06	0.03	0.73	0.27
109	1798	31.31	6.45	2.07	1.26	21.47	37.88	0.06	100.44	2.06	0.76	0.17	0.08	1.99	2.97	0.00	8.03	0.67	0.25	0.06	0.03	0.73	0.27
110	1815	31.68	6.38	2.00	1.53	21.86	38.11	0.00	101.57	2.06	0.74	0.17	0.10	2.00	2.96	0.00	8.03	0.67	0.24	0.05	0.03	0.74	0.26
112	1848	31.62	6.43	2.11	1.30	21.56	37.47	0.04	100.49	2.08	0.75	0.18	0.09	2.00	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.73	0.27
113	1865	31.76	6.19	2.15	1.32	21.74	38.45	0.10	101.61	2.06	0.72	0.18	0.09	1.99	2.99	0.01	8.02	0.68	0.24	0.06	0.03	0.74	0.26
115	1898	31.85	6.11	2.13	1.29	21.60	38.15	0.05	101.13	2.08	0.71	0.18	0.09	1.99	2.98	0.00	8.03	0.68	0.23	0.06	0.03	0.75	0.25
116	1915	31.85	6.20	2.34	1.38	21.92	38.42	0.03	102.11	2.06	0.71	0.19	0.09	2.00	2.97	0.00	8.03	0.67	0.23	0.06	0.03	0.74	0.26
117	1931	31.20	6.15	2.23	1.32	21.80	37.97	0.11	100.67	2.04	0.72	0.19	0.09	2.01	2.97	0.01	8.02	0.67	0.24	0.06	0.03	0.74	0.26
118	1948	31.86	6.34	2.23	1.27	21.92	37.82	0.00	101.44	2.08	0.74	0.19	0.08	2.01	2.95	0.00	8.05	0.67	0.24	0.06	0.03	0.74	0.26
119	1965	31.56	6.04	2.28	1.26	21.72	37.93	0.00	100.80	2.07	0.71	0.19	0.08	2.01	2.97	0.00	8.03	0.68	0.23	0.06	0.03	0.75	0.25
120	1981	31.24	6.18	2.21	1.24	21.72	38.08	0.00	100.66	2.04	0.72	0.19	0.08	2.00	2.98	0.00	8.02	0.67	0.24	0.06	0.03	0.74	0.26
121	1998	31.67	6.19	2.37	1.44	21.97	37.69	0.00	101.32	2.07	0.72	0.20	0.10	2.02	2.94	0.00	8.05	0.67	0.23	0.06	0.03	0.74	0.26
122	2015	31.42	6.07	2.30	1.47	21.81	37.71	0.00	100.78	2.06	0.71	0.19	0.10	2.02	2.96	0.00	8.03	0.67	0.23	0.06	0.03	0.74	0.26
123	2031	32.35	6.03	2.24	1.47	21.96	38.07	0.00	102.12	2.10	0.70	0.19	0.10	2.01	2.95	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
124	2048	32.12	6.07	2.35	1.33	21.89	38.10	0.05	101.87	2.09	0.70	0.20	0.09	2.00	2.96	0.00	8.04	0.68	0.23	0.06	0.03	0.75	0.25
127	2098	32.62	5.66	2.19	1.55	21.80	37.96	0.00	101.78	2.13	0.66	0.18	0.10	2.00	2.96	0.00	8.04	0.69	0.21	0.06	0.03	0.76	0.24
128	2115	32.08	5.69	2.35	1.53	21.77	37.45	0.00	100.86	2.11	0.67	0.20	0.10	2.02	2.95	0.00	8.04	0.69	0.22	0.06	0.03	0.76	0.24
129	2131	32.63	5.11	2.32	1.53	21.35	37.39	0.02	100.33	2.17	0.60	0.20	0.10	2.00	2.97	0.00	8.03	0.71	0.20	0.06	0.03	0.78	0.22
130	2148	32.74	4.83	2.35	1.53	21.60	37.03	0.07	100.08	2.18	0.57	0.20	0.10	2.03	2.95	0.00	8.04	0.71	0.19	0.07	0.03	0.79	0.21
133	2198	32.37	5.07	2.52	1.49	21.67	37.97	0.09	101.08	2.13	0.59	0.21	0.10	2.01	2.98	0.01	8.02	0.70	0.20	0.07	0.03	0.78	0.22
134	2214	33.01	4.67	2.74	1.63	21.62	37.64	0.06	101.33	2.17	0.55	0.23	0.11	2.01	2.96	0.00	8.03	0.71	0.18	0.08	0.04	0.80	0.20
139	2298	31.93	5.28	2.61	1.63	21.71	37.96	0.00	101.11	2.09	0.62	0.22	0.11	2.01	2.98	0.00	8.02	0.69	0.20	0.07	0.04	0.77	0.23
140	2314	31.86	5.52	2.56	1.53	21.54	37.71	0.00	100.72	2.10	0.65	0.22	0.10	2.00	2.97	0.00	8.03	0.68	0.21	0.07	0.03	0.76	0.24
141	2331	32.48	5.37	2.46	1.40	21.75	38.07	0.00	101.53	2.12	0.63	0.21	0.09	2.00	2.97	0.00	8.02	0.70	0.21	0.07	0.03	0.77	0.23
142	2348	32.50	5.43	2.44	1.47	21.76	37.83	0.06	101.42	2.13	0.63	0.20	0.10	2.01	2.96	0.00	8.03	0.69	0.21	0.07	0.03	0.77	0.23
143	2364	32.13	5.28	2.52	1.52	21.91	37.50	0.05	100.86	2.11	0.62	0.21	0.10	2.03	2.95	0.00	8.03	0.69	0.20	0.07	0.03	0.77	0.23
144	2381	32.42	5.66	2.38	1.37	22.07	37.98	0.03	101.88	2.11	0.66	0.20	0.09	2.02	2.95	0.00	8.03	0.69	0.21	0.07	0.03	0.76	0.24
145	2398	32.90	5.38	2.27	1.66	21.87	37.76	0.06	101.85	2.15	0.63	0.19	0.11	2.01	2.95	0.00	8.04	0.70	0.20	0.06	0.04	0.77	0.23
146	2414	32.66	5.27	2.43	1.50	21.90	38.13	0.00	101.90	2.13	0.61	0.20	0.10	2.01	2.97	0.00	8.02	0.70	0.20	0.07	0.03	0.78	0.22
147	2431	32.45	5.17	2.40	1.64	21.85	37.49	0.06	101.00	2.14	0.61	0.20	0.11	2.03	2.95	0.00	8.03	0.70	0.20	0.07	0.04	0.78	0.22
148	2448	32.25	5.01	2.46	1.40	21.76	37.75	0.01	100.63	2.13	0.59	0.21	0.09	2.02	2.98	0.00	8.01	0.70	0.20	0.07	0.03	0.78	0.22

149	2464	32.52	5.05	2.62	1.64	21.84	38.15	0.04	102.15	2.12	0.59	0.22	0.11	2.00	2.97	0.00	8.05	0.70	0.19	0.07	0.04	0.78	0.22
150	2481	31.95	4.98	2.53	1.65	21.60	37.63	0.07	100.34	2.11	0.59	0.21	0.11	2.01	2.98	0.00	8.02	0.70	0.19	0.07	0.04	0.78	0.22

Table 3.19.b: Qualitative trace element analyses of Garnet II from sample 288 along traverse C-D (Plate 7.7). Relative concentrations are measured in counts\second. **D** = distance from starting point C in microns. Anomalous analyses due to the presence of inclusions have been omitted.

#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P	#	D	Ti	Cr	Y	Sc	P
1	0	1479	2458	2195	1374	3342	47	766	1392	2444	2135	1185	3409	94	1548	1336	2397	2177	1223	3173
2	17	1432	2439	2252	1260	3297	48	783	1350	2338	2110	1194	3301	95	1565	1392	2285	2170	1226	3361
3	33	1427	2458	2227	1327	3360	49	799	1334	2459	1982	1234	3348	96	1582	1299	2370	2116	1176	3220
4	50	1389	2398	2265	1208	3416	50	816	1382	2499	2121	1174	3479	97	1598	1321	2385	2064	1164	3224
5	67	1380	2440	2251	1283	3413	51	833	1387	2366	2124	1163	3316	98	1615	1390	2345	2196	1238	3313
6	83	1344	2430	2305	1266	3250	52	849	1396	2517	2118	1162	3577	99	1632	1373	2315	2148	1186	3441
7	100	1332	2455	2262	1216	3163	53	866	1374	2461	2186	1146	3354	100	1648	1376	2365	2066	1217	3249
8	117	1375	2424	2223	1177	3370	54	882	1343	2364	2190	1177	3546	102	1682	1355	2428	2196	1101	3134
9	133	1189	2262	2123	1145	3031	55	899	1389	2296	2172	1174	3251	103	1698	1330	2325	2199	1241	3227
10	150	1325	2456	2118	1261	3266	56	916	1349	2445	2117	1179	3276	104	1715	1366	2333	2193	1230	3248
11	167	1322	2389	2190	1257	3203	57	932	1349	2387	2096	1185	3367	105	1732	1393	2340	2182	1214	3337
12	183	1303	2520	2191	1285	3244	58	949	1322	2462	2032	1210	3351	106	1748	1362	2413	2085	1162	3378
13	200	1409	2480	2094	1248	3268	59	966	1385	2434	2152	1153	3370	107	1765	1310	2372	2139	1221	3373
14	216	1336	2396	2126	1222	3224	60	982	1365	2408	2237	1194	3322	108	1782	1319	2384	2234	1244	3449
15	233	1353	2415	2176	1216	3186	61	999	1331	2470	2186	1163	3281	109	1798	1357	2433	2181	1234	3281
16	250	1354	2447	2158	1194	3247	62	1016	1328	2476	2153	1199	3141	110	1815	1311	2313	2103	1161	3368
17	266	1380	2433	2123	1175	3300	63	1032	1340	2311	2227	1224	3110	111	1832	1326	2479	2198	1207	3402
18	283	1442	2482	2120	1146	3364	64	1049	1312	2438	2209	1202	3193	112	1848	1335	2445	2208	1191	3311
19	300	1348	2467	2224	1208	3356	65	1066	1327	2416	2214	1189	3119	113	1865	1333	2389	2277	1206	3420
20	316	1347	2453	2149	1203	3475	66	1082	1363	2380	2078	1181	3231	114	1881	1258	2418	2205	1214	3332
21	333	1416	2361	2144	1276	3465	67	1099	1396	2401	2166	1274	3184	115	1898	1354	2302	2127	1198	3185
22	350	1399	2355	2228	1116	3528	68	1116	1439	2432	2141	1227	3054	116	1915	1343	2331	2190	1244	3348
23	366	1355	2299	2123	1129	3071	69	1132	1340	2357	2149	1130	3263	117	1931	1351	2365	2168	1184	3279
24	383	1327	2478	2086	1143	3502	70	1149	1344	2326	2136	1152	3159	118	1948	1373	2350	2154	1229	3427
25	400	1331	2506	2188	1153	3559	72	1182	1351	2375	2222	1194	3333	119	1965	1310	2450	2086	1175	3399
26	416	1323	2434	2200	1175	3336	73	1199	1406	2478	2240	1221	3283	120	1981	1341	2393	2215	1255	3365
27	433	1367	2423	2128	1204	3442	74	1215	1384	2384	2140	1228	3300	121	1998	1360	2437	2289	1271	3376
28	450	1352	2449	2103	1150	3366	75	1232	1353	2335	2116	1203	3462	122	2015	1356	2363	2214	1184	3251
29	466	1420	2467	2189	1169	3488	76	1249	1409	2420	2085	1217	3361	123	2031	1317	2319	2112	1137	3193
30	483	1401	2418	2136	1197	3378	77	1265	1341	2364	2070	1166	3392	124	2048	1290	2293	2140	1234	3220
31	500	1405	2447	2178	1213	3390	78	1282	1397	2419	2108	1215	3379	125	2065	1262	2249	2043	1116	3413
32	516	1336	2429	2199	1216	3435	79	1299	1329	2399	2137	1256	3253	126	2081	1389	2305	2190	1211	3383
33	533	1279	2218	1874	1086	2906	80	1315	1363	2379	2142	1200	3272	127	2098	1285	2052	1971	1018	3461
34	549	1323	2411	2120	1135	3520	81	1332	1385	2347	2228	1193	3331	128	2115	1306	2152	1962	1011	3492
35	566	1392	2369	2129	1111	3368	82	1349	1395	2298	2151	1197	3255	129	2131	1700	2077	2161	1015	3576
36	583	1366	2362	2054	1213	3301	83	1365	1319	2316	2156	1201	3284	142	2348	1394	2439	2175	1243	3274
37	599	1335	2496	2149	1159	3283	84	1382	1300	2389	2057	1198	3326	143	2364	1312	2439	2165	1205	3283
38	616	1413	2392	2085	1204	3360	85	1399	1344	2313	2094	1179	3393	144	2381	1354	2343	2265	1224	3318
39	633	1405	2397	2159	1159	3337	86	1415	1442	2348	2176	1152	3109	145	2398	1245	2414	2200	1172	3269
40	649	1390	2395	2085	1225	3447	87	1432	1374	2417	2062	1125	3343	146	2414	1312	2366	2151	1225	3255
41	666	1324	2506	2140	1162	3527	88	1449	1358	2449	2135	1166	3346	147	2431	1277	2468	2219	1232	3510
42	683	1311	2387	2179	1129	3217	89	1465	1393	2249	2138	1201	3265	148	2448	1405	2429	2193	1266	3313
43	699	1343	2392	2275	1196	3414	90	1482	1416	2292	2057	1228	3205	149	2464	1314	2459	2210	1206	3264
44	716	1459	2421	2121	1123	3479	91	1499	1368	2422	2140	1252	3250	150	2481	1372	2445	2251	1300	3248
45	733	1369	2486	2053	1160	3414	92	1515	1361	2349	2062	1195	3261							
46	749	1451	2403	2029	1157	3348	93	1532	1415	2278	2150	1232	3251							

APPENDIX 4: BIOTITE ANALYSES

Table 4.1: Biotite analyses from sample 100. Analyzed grains are labeled numerically with 'r' indicating a rim analysis and 'c' representing a core analysis. T2=biotite in contact with garnet, T3=biotite adjacent to garnet and T4=biotite isolated from garnet in the matrix.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{IV}	Al^{VI}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
1r	2	9.48	36.03	18.75	16.77	10.80	0.10	2.85	94.68	0.91	2.72	1.28	0.39	1.06	1.22	0.01	0.16	7.74	0.47	0.53	0.43	0.37	0.14	0.06
1c	2	9.49	36.04	19.13	19.20	9.79	0.04	2.65	96.62	0.91	2.70	1.30	0.39	1.20	1.09	0.00	0.15	7.78	0.52	0.48	0.39	0.42	0.14	0.05
2c	2	8.78	36.62	19.17	16.66	11.37	0.13	2.99	95.59	0.83	2.72	1.28	0.40	1.03	1.26	0.01	0.17	7.69	0.45	0.55	0.44	0.36	0.14	0.06
3c	3	9.95	35.95	18.87	15.69	11.37	0.02	3.09	94.92	0.95	2.70	1.30	0.37	0.99	1.27	0.00	0.17	7.76	0.44	0.56	0.45	0.35	0.13	0.06
4c	4	9.80	35.21	18.20	17.72	9.80	0.00	4.23	94.96	0.95	2.68	1.32	0.31	1.13	1.11	0.00	0.24	7.74	0.50	0.50	0.40	0.40	0.11	0.09
6c	4	9.51	35.20	18.45	17.40	9.82	0.09	4.19	94.57	0.92	2.68	1.32	0.33	1.11	1.11	0.01	0.24	7.72	0.50	0.50	0.40	0.40	0.12	0.09
7c	4	9.83	35.83	18.19	18.17	9.51	0.00	4.29	95.83	0.95	2.70	1.30	0.32	1.15	1.07	0.00	0.24	7.72	0.52	0.48	0.39	0.41	0.11	0.09
8c	4	9.53	35.77	19.14	17.66	9.98	0.10	4.19	96.26	0.91	2.67	1.33	0.35	1.10	1.11	0.01	0.23	7.71	0.50	0.50	0.40	0.39	0.13	0.08
9c	4	9.39	35.65	18.91	17.37	9.75	0.15	4.07	95.14	0.90	2.69	1.31	0.37	1.10	1.10	0.01	0.23	7.69	0.50	0.50	0.39	0.39	0.13	0.08
10c	4	10.01	35.91	18.52	17.02	9.70	0.02	4.45	95.60	0.96	2.70	1.30	0.34	1.07	1.09	0.00	0.25	7.71	0.50	0.50	0.40	0.39	0.12	0.09
11c	4	9.77	35.64	18.37	17.75	9.73	0.14	4.03	95.27	0.94	2.70	1.30	0.33	1.12	1.10	0.01	0.23	7.73	0.51	0.49	0.39	0.40	0.12	0.08
13c	4	9.72	35.69	18.35	18.63	8.89	0.16	4.13	95.40	0.94	2.71	1.29	0.35	1.18	1.00	0.01	0.24	7.71	0.54	0.46	0.36	0.43	0.13	0.09
14c	4	9.90	35.49	18.40	18.14	9.52	0.00	4.40	95.85	0.95	2.68	1.32	0.31	1.14	1.07	0.00	0.25	7.73	0.52	0.48	0.39	0.41	0.11	0.09
16c	4	9.24	35.05	18.25	17.78	9.45	0.07	4.11	93.89	0.90	2.69	1.31	0.34	1.14	1.08	0.00	0.24	7.70	0.51	0.49	0.39	0.41	0.12	0.08
17c	4	9.97	35.67	18.62	17.70	9.57	0.11	4.27	95.80	0.96	2.69	1.31	0.34	1.11	1.07	0.01	0.24	7.73	0.51	0.49	0.39	0.40	0.12	0.09
18c	4	9.36	35.51	19.41	17.42	9.54	0.12	4.30	95.80	0.89	2.66	1.34	0.37	1.09	1.07	0.01	0.24	7.69	0.51	0.49	0.38	0.39	0.13	0.09
20c	4	9.87	35.97	18.73	18.13	9.67	0.14	4.23	96.59	0.94	2.69	1.31	0.34	1.13	1.08	0.01	0.24	7.72	0.51	0.49	0.39	0.41	0.12	0.09
19c	4	9.82	35.53	18.39	17.82	9.67	0.00	4.11	95.33	0.95	2.69	1.31	0.33	1.13	1.09	0.00	0.23	7.73	0.51	0.49	0.39	0.41	0.12	0.08
21c	2	9.99	35.25	18.38	18.98	8.87	0.05	4.02	95.49	0.97	2.68	1.32	0.33	1.21	1.01	0.00	0.23	7.75	0.55	0.45	0.36	0.44	0.12	0.08
21r	2	9.50	35.62	18.62	17.62	9.80	0.05	3.99	95.14	0.92	2.69	1.31	0.35	1.11	1.10	0.00	0.23	7.71	0.50	0.50	0.40	0.40	0.13	0.08
22c	2	9.84	36.00	18.79	18.10	9.91	0.02	4.08	96.72	0.94	2.68	1.32	0.34	1.13	1.10	0.00	0.23	7.73	0.51	0.49	0.39	0.40	0.12	0.08
22r	2	9.82	36.01	18.52	17.83	9.71	0.05	4.00	95.90	0.94	2.71	1.30	0.35	1.12	1.09	0.00	0.23	7.72	0.51	0.49	0.39	0.40	0.12	0.08
23c	2	9.75	35.46	18.47	17.61	9.68	0.03	3.93	94.90	0.94	2.69	1.31	0.35	1.12	1.10	0.00	0.22	7.73	0.51	0.49	0.39	0.40	0.12	0.08
23r	2	9.89	36.04	18.56	17.73	9.87	0.09	4.05	96.15	0.95	2.70	1.30	0.34	1.11	1.10	0.01	0.23	7.73	0.50	0.50	0.40	0.40	0.12	0.08
24c	2	9.84	35.97	18.52	17.71	9.64	0.07	4.18	95.85	0.94	2.70	1.30	0.34	1.11	1.08	0.00	0.24	7.71	0.51	0.49	0.39	0.40	0.12	0.09
24r	2	9.92	35.74	18.43	17.86	9.77	0.00	3.94	95.65	0.95	2.70	1.30	0.33	1.13	1.10	0.00	0.22	7.74	0.51	0.49	0.39	0.40	0.12	0.08
25c	2	9.35	35.98	19.43	15.39	11.44	0.00	2.77	94.53	0.90	2.70	1.30	0.42	0.97	1.28	0.00	0.16	7.73	0.43	0.57	0.45	0.34	0.15	0.06
25r	2	9.61	35.80	19.06	15.51	11.21	0.06	2.85	94.39	0.93	2.70	1.30	0.40	0.98	1.26	0.00	0.16	7.78	0.44	0.56	0.45	0.35	0.14	0.06

26c	3	9.76	35.29	18.09	17.33	9.57	0.03	4.32	94.35	0.95	2.69	1.31	0.32	1.11	1.09	0.00	0.25	7.72	0.50	0.50	0.39	0.40	0.12	0.09
26r	3	9.80	35.58	18.47	17.22	9.69	0.03	4.10	94.85	0.95	2.70	1.30	0.35	1.09	1.10	0.00	0.23	7.72	0.50	0.50	0.40	0.39	0.13	0.08
27c	3	9.71	35.71	19.06	18.63	9.09	0.07	3.85	96.05	0.93	2.69	1.31	0.38	1.17	1.02	0.00	0.22	7.72	0.53	0.47	0.37	0.42	0.14	0.08
28c	4	8.95	36.05	18.78	17.57	9.51	0.17	4.10	94.97	0.86	2.72	1.28	0.38	1.11	1.07	0.01	0.23	7.65	0.51	0.49	0.38	0.40	0.14	0.08
29c	4	9.70	35.52	18.80	17.59	9.64	0.15	4.16	95.41	0.93	2.68	1.32	0.35	1.11	1.08	0.01	0.24	7.71	0.51	0.49	0.39	0.40	0.13	0.08
30c	4	9.54	35.81	18.33	17.76	9.62	0.15	4.20	95.26	0.92	2.70	1.30	0.34	1.12	1.08	0.01	0.24	7.70	0.51	0.49	0.39	0.40	0.12	0.09
31c	4	9.00	35.77	18.63	17.77	9.74	0.00	4.10	95.01	0.87	2.70	1.30	0.36	1.12	1.10	0.00	0.23	7.67	0.51	0.49	0.39	0.40	0.13	0.08
33c	4	9.71	35.95	19.21	17.50	9.77	0.14	3.88	96.18	0.93	2.69	1.31	0.38	1.09	1.09	0.01	0.22	7.71	0.50	0.50	0.39	0.39	0.14	0.08
34c	4	9.60	35.81	18.00	17.61	9.58	0.11	4.28	94.88	0.93	2.72	1.28	0.33	1.12	1.08	0.01	0.24	7.70	0.51	0.49	0.39	0.40	0.12	0.09
35c	4	9.30	35.69	18.82	17.37	9.98	0.00	3.38	94.54	0.90	2.71	1.29	0.39	1.10	1.13	0.00	0.19	7.71	0.49	0.51	0.40	0.39	0.14	0.07
36c	3	9.95	35.67	18.20	20.12	8.47	0.05	4.14	96.56	0.96	2.70	1.30	0.32	1.27	0.95	0.00	0.24	7.74	0.57	0.43	0.34	0.46	0.11	0.08
36r	3	9.57	35.14	17.92	20.03	8.55	0.19	3.93	95.13	0.94	2.69	1.31	0.31	1.28	0.98	0.01	0.23	7.74	0.57	0.43	0.35	0.46	0.11	0.08
37c	4	10.17	35.40	18.36	18.04	9.47	0.02	4.35	95.79	0.98	2.68	1.32	0.31	1.14	1.07	0.00	0.25	7.75	0.52	0.48	0.39	0.41	0.11	0.09
38c	4	9.70	35.63	18.49	18.67	9.00	0.00	3.77	95.27	0.94	2.71	1.29	0.36	1.19	1.02	0.00	0.22	7.72	0.54	0.46	0.37	0.43	0.13	0.08
39c	4	9.80	35.74	18.48	17.84	9.70	0.17	4.09	95.64	0.94	2.69	1.31	0.34	1.12	1.09	0.01	0.23	7.72	0.51	0.49	0.39	0.40	0.12	0.08
40c	4	9.88	35.86	18.50	17.54	9.56	0.07	4.35	95.68	0.95	2.70	1.30	0.34	1.10	1.07	0.00	0.25	7.71	0.51	0.49	0.39	0.40	0.12	0.09
41c	4	9.80	35.07	18.20	17.38	9.49	0.12	3.88	93.82	0.96	2.70	1.30	0.35	1.12	1.09	0.01	0.22	7.74	0.51	0.49	0.39	0.40	0.12	0.08
42c	4	9.82	35.49	18.32	19.82	8.42	0.00	3.45	95.33	0.96	2.71	1.29	0.36	1.27	0.96	0.00	0.20	7.74	0.57	0.43	0.34	0.45	0.13	0.07
43c	4	9.53	35.55	18.37	18.80	9.09	0.10	3.87	95.55	0.92	2.70	1.30	0.34	1.19	1.03	0.01	0.22	7.75	0.54	0.46	0.37	0.43	0.12	0.08
44c	4	9.89	35.54	18.76	17.75	9.53	0.02	3.92	95.39	0.95	2.69	1.31	0.36	1.12	1.07	0.00	0.22	7.73	0.51	0.49	0.39	0.40	0.13	0.08
45c	4	9.70	35.53	18.70	18.41	9.40	0.05	4.02	95.76	0.93	2.68	1.32	0.34	1.16	1.06	0.00	0.23	7.73	0.52	0.48	0.38	0.42	0.12	0.08
46c	4	9.69	35.36	18.27	18.47	9.15	0.03	4.13	95.07	0.94	2.69	1.31	0.33	1.18	1.04	0.00	0.24	7.72	0.53	0.47	0.37	0.42	0.12	0.08
47c	4	9.36	36.46	19.54	17.39	9.86	0.13	3.78	96.40	0.89	2.70	1.30	0.41	1.08	1.09	0.01	0.21	7.68	0.50	0.50	0.39	0.39	0.15	0.08
48c	4	9.65	35.61	19.08	17.79	9.77	0.16	4.10	96.01	0.92	2.67	1.33	0.36	1.12	1.09	0.01	0.23	7.72	0.51	0.49	0.39	0.40	0.13	0.08
49c	4	9.66	35.49	18.86	17.18	9.48	0.07	4.09	94.75	0.93	2.69	1.31	0.37	1.09	1.07	0.00	0.23	7.70	0.50	0.50	0.39	0.39	0.14	0.08
50c	4	9.74	35.57	18.42	17.95	9.52	0.17	4.15	95.36	0.94	2.69	1.31	0.33	1.14	1.07	0.01	0.24	7.72	0.51	0.49	0.39	0.41	0.12	0.08
51c	3	9.59	35.90	18.99	18.92	9.03	0.24	3.71	96.38	0.92	2.69	1.31	0.37	1.19	1.01	0.02	0.21	7.72	0.54	0.46	0.36	0.43	0.13	0.08
51r	3	9.84	36.19	19.08	19.13	8.86	0.01	3.71	96.82	0.94	2.70	1.30	0.39	1.20	0.99	0.00	0.21	7.72	0.55	0.45	0.36	0.43	0.14	0.08
52c	3	9.55	35.09	18.71	19.48	8.79	0.13	3.61	95.23	0.93	2.68	1.32	0.36	1.24	1.00	0.01	0.21	7.74	0.55	0.45	0.36	0.44	0.13	0.07
52r	3	9.64	35.53	19.03	19.03	8.49	0.01	3.73	95.45	0.93	2.69	1.31	0.40	1.21	0.96	0.00	0.21	7.71	0.56	0.44	0.35	0.43	0.14	0.08
53c	2	9.94	35.54	18.70	17.50	9.85	0.00	3.96	95.48	0.96	2.68	1.32	0.35	1.10	1.11	0.00	0.22	7.74	0.50	0.50	0.40	0.40	0.12	0.08
53r	2	9.81	35.94	19.13	16.87	10.13	0.16	3.77	95.81	0.94	2.69	1.31	0.38	1.06	1.13	0.01	0.21	7.72	0.48	0.52	0.41	0.38	0.14	0.08
54c	2	9.80	36.03	19.09	15.26	11.53	0.00	2.86	94.56	0.94	2.71	1.29	0.40	0.96	1.29	0.00	0.16	7.75	0.43	0.57	0.46	0.34	0.14	0.06
54r	2	9.32	35.54	18.91	14.91	11.63	0.06	2.56	93.18	0.91	2.71	1.29	0.40	0.95	1.32	0.00	0.15	7.75	0.42	0.58	0.47	0.34	0.14	0.05

55c	3	9.87	35.75	18.60	17.61	9.66	0.13	3.91	95.39	0.95	2.70	1.30	0.35	1.11	1.09	0.01	0.22	7.73	0.51	0.49	0.39	0.40	0.13	0.08
56c	3	9.94	35.55	18.68	17.88	9.75	0.07	3.82	95.63	0.96	2.68	1.32	0.35	1.13	1.10	0.00	0.22	7.75	0.51	0.49	0.39	0.40	0.12	0.08
57c	3	10.01	35.71	18.50	17.44	9.72	0.15	3.66	95.03	0.97	2.71	1.29	0.36	1.11	1.10	0.01	0.21	7.74	0.50	0.50	0.40	0.40	0.13	0.08
58c	4	9.17	34.74	17.82	17.45	9.45	0.01	4.04	92.67	0.91	2.70	1.30	0.33	1.13	1.09	0.00	0.24	7.70	0.51	0.49	0.39	0.41	0.12	0.08
59c	4	9.70	34.59	17.99	18.03	9.32	0.02	3.96	93.58	0.96	2.68	1.32	0.32	1.17	1.08	0.00	0.23	7.75	0.52	0.48	0.39	0.42	0.11	0.08
60c	4	9.92	35.69	18.79	17.94	9.70	0.04	4.01	96.05	0.95	2.68	1.32	0.35	1.13	1.09	0.00	0.23	7.74	0.51	0.49	0.39	0.40	0.12	0.08
61c	4	10.10	35.54	18.31	17.75	9.50	0.00	4.14	95.35	0.98	2.69	1.31	0.33	1.13	1.07	0.00	0.24	7.74	0.51	0.49	0.39	0.41	0.12	0.09
62c	4	9.96	35.66	18.57	17.16	9.89	0.06	3.92	95.15	0.96	2.70	1.30	0.35	1.09	1.11	0.00	0.22	7.73	0.49	0.51	0.40	0.39	0.13	0.08

Table 4.2: Biotite analyses from specimen 11E1. Analyzed grains are labeled numerically with 'r' indicating a rim analysis and 'c' representing a core analysis. T2=biotite in contact with garnet, T3=biotite adjacent to garnet and T4=biotite isolated from garnet in the matrix.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{IV}	Al^{VI}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{o}$	(X_{AlVI})	$(X_{Ti})^{oc}$
1c	3	8.76	34.29	19.68	12.72	12.19	0.07	3.17	90.81	0.86	2.65	1.35	0.44	0.82	1.40	0.00	0.18	7.71	0.37	0.63	0.29	0.49	0.15	0.06
2c	3	9.22	35.88	18.14	13.65	13.10	0.10	3.22	93.56	0.89	2.71	1.29	0.32	0.86	1.47	0.01	0.18	7.77	0.37	0.63	0.30	0.52	0.11	0.06
4c	4	9.44	36.18	18.28	13.24	12.82	0.00	3.19	93.15	0.91	2.73	1.27	0.36	0.84	1.44	0.00	0.18	7.73	0.37	0.63	0.30	0.51	0.13	0.06
5c	4	9.04	35.10	17.86	13.69	12.48	0.00	3.44	91.60	0.89	2.70	1.30	0.33	0.88	1.43	0.00	0.20	7.73	0.38	0.62	0.31	0.50	0.11	0.07
6c	4	8.74	34.47	18.46	13.43	12.49	0.00	3.28	90.86	0.86	2.67	1.33	0.36	0.87	1.44	0.00	0.19	7.73	0.38	0.62	0.30	0.50	0.13	0.07
7c	4	9.13	34.44	17.54	13.78	12.23	0.00	3.24	90.38	0.91	2.70	1.30	0.32	0.90	1.43	0.00	0.19	7.76	0.39	0.61	0.32	0.50	0.11	0.07
8c	4	9.02	34.79	17.97	13.04	12.70	0.04	3.12	90.92	0.89	2.70	1.30	0.34	0.85	1.47	0.00	0.18	7.77	0.37	0.63	0.30	0.52	0.12	0.06
9c	4	9.50	35.52	17.44	13.84	12.89	0.00	3.31	92.77	0.93	2.71	1.29	0.28	0.88	1.47	0.00	0.19	7.79	0.38	0.62	0.31	0.52	0.10	0.07
10c	3	9.37	35.72	18.11	13.39	12.98	0.00	3.46	93.02	0.91	2.71	1.29	0.32	0.85	1.47	0.00	0.20	7.74	0.37	0.63	0.30	0.52	0.11	0.07
11c	3	9.12	36.02	18.22	13.26	13.13	0.00	3.17	92.92	0.88	2.72	1.28	0.35	0.84	1.48	0.00	0.18	7.72	0.36	0.64	0.29	0.52	0.12	0.06
12c	2	8.74	36.44	18.61	13.58	13.72	0.01	3.19	94.28	0.83	2.71	1.29	0.34	0.84	1.52	0.00	0.18	7.71	0.36	0.64	0.29	0.53	0.12	0.06
13c	2	8.54	34.61	17.46	13.10	13.09	0.04	3.30	90.28	0.85	2.70	1.30	0.30	0.85	1.52	0.00	0.19	7.73	0.36	0.64	0.30	0.53	0.10	0.07
13r	2	8.60	36.12	18.48	12.90	14.29	0.13	3.13	93.80	0.82	2.69	1.31	0.32	0.80	1.59	0.01	0.18	7.73	0.34	0.66	0.28	0.55	0.11	0.06
14c	2	9.00	36.64	18.67	12.92	14.46	0.00	3.09	95.42	0.84	2.69	1.31	0.31	0.79	1.58	0.00	0.17	7.78	0.33	0.67	0.28	0.55	0.11	0.06
15c	2	9.38	35.30	17.46	13.15	13.24	0.00	3.30	92.12	0.92	2.71	1.29	0.29	0.84	1.51	0.00	0.19	7.79	0.36	0.64	0.30	0.53	0.10	0.07
16c	2	9.58	35.68	18.09	13.62	12.90	0.00	3.25	93.43	0.93	2.70	1.30	0.32	0.86	1.46	0.00	0.19	7.79	0.37	0.63	0.31	0.52	0.11	0.07
16r	2	9.52	36.85	18.79	13.25	13.53	0.00	3.19	95.42	0.89	2.71	1.29	0.35	0.82	1.49	0.00	0.18	7.76	0.35	0.65	0.29	0.53	0.12	0.06
17c	2	9.68	36.18	18.29	13.28	13.36	0.00	3.25	94.27	0.92	2.71	1.29	0.32	0.83	1.49	0.00	0.18	7.78	0.36	0.64	0.29	0.53	0.11	0.06
17r	2	9.01	36.89	19.01	13.06	13.82	0.09	3.06	95.12	0.85	2.71	1.29	0.36	0.80	1.52	0.01	0.17	7.73	0.35	0.65	0.28	0.53	0.13	0.06
18r	2	9.24	35.76	18.29	13.30	13.16	0.06	3.09	92.84	0.89	2.71	1.29	0.34	0.84	1.49	0.00	0.18	7.74	0.36	0.64	0.30	0.52	0.12	0.06
18c	2	9.51	35.89	18.25	13.54	13.08	0.00	3.26	93.85	0.91	2.70	1.30	0.32	0.85	1.47	0.00	0.18	7.78	0.37	0.63	0.30	0.52	0.11	0.07
19c	2	9.05	36.35	18.57	13.23	13.29	0.05	3.19	93.68	0.86	2.72	1.28	0.36	0.83	1.48	0.00	0.18	7.71	0.36	0.64	0.29	0.52	0.13	0.06
19r	2	8.24	35.41	18.15	12.80	13.07	0.03	2.79	90.67	0.81	2.73	1.27	0.38	0.83	1.50	0.00	0.16	7.69	0.35	0.65	0.29	0.52	0.13	0.06
20c	3	9.37	35.64	17.93	13.15	13.10	0.00	3.20	92.39	0.91	2.72	1.28	0.33	0.84	1.49	0.00	0.18	7.75	0.36	0.64	0.30	0.52	0.12	0.06
21c	3	9.06	35.65	17.89	14.14	12.70	0.13	3.27	92.71	0.88	2.72	1.28	0.32	0.90	1.44	0.01	0.19	7.73	0.38	0.62	0.32	0.51	0.11	0.07
22c	3	9.61	36.31	18.23	13.53	12.98	0.05	3.33	94.26	0.92	2.72	1.28	0.33	0.85	1.45	0.00	0.19	7.77	0.37	0.63	0.30	0.52	0.12	0.07
23c	3	9.43	35.84	17.74	13.55	12.65	0.02	3.36	92.57	0.92	2.73	1.27	0.33	0.86	1.44	0.00	0.19	7.74	0.38	0.62	0.31	0.51	0.12	0.07
24c	3	9.50	35.91	18.09	13.07	13.17	0.00	3.47	93.44	0.91	2.71	1.29	0.32	0.82	1.48	0.00	0.20	7.76	0.36	0.64	0.29	0.53	0.11	0.07

25c	3	9.41	35.93	17.98	13.79	13.29	0.00	3.52	93.92	0.90	2.70	1.30	0.30	0.87	1.49	0.00	0.20	7.75	0.37	0.63	0.30	0.52	0.10	0.07
26c	3	9.00	36.25	18.18	13.18	13.39	0.06	3.19	93.42	0.86	2.72	1.28	0.33	0.83	1.50	0.00	0.18	7.74	0.36	0.64	0.29	0.53	0.12	0.06
27c	3	9.14	35.90	17.82	13.63	12.94	0.01	3.67	93.10	0.88	2.72	1.28	0.31	0.86	1.46	0.00	0.21	7.72	0.37	0.63	0.30	0.51	0.11	0.07
28c	4	9.61	35.48	17.72	13.39	12.24	0.00	3.33	91.76	0.94	2.73	1.27	0.34	0.86	1.40	0.00	0.19	7.74	0.38	0.62	0.31	0.50	0.12	0.07
29c	4	9.76	35.72	17.85	13.47	12.80	0.04	3.18	92.79	0.95	2.72	1.28	0.32	0.86	1.45	0.00	0.18	7.77	0.37	0.63	0.30	0.52	0.12	0.06
30c	4	9.84	36.23	18.60	13.34	12.57	0.07	3.47	94.29	0.94	2.71	1.29	0.35	0.83	1.40	0.00	0.20	7.76	0.37	0.63	0.30	0.50	0.13	0.07
31c	4	9.55	36.58	18.77	13.40	12.85	0.00	3.20	94.35	0.91	2.73	1.27	0.37	0.83	1.43	0.00	0.18	7.72	0.37	0.63	0.30	0.51	0.13	0.06
34c	4	9.19	35.58	18.17	13.28	12.37	0.00	3.06	91.78	0.90	2.73	1.27	0.37	0.85	1.41	0.00	0.18	7.72	0.38	0.62	0.30	0.50	0.13	0.06
35c	4	9.70	35.73	18.24	13.29	12.81	0.10	3.15	92.92	0.94	2.71	1.29	0.35	0.84	1.45	0.01	0.18	7.76	0.37	0.63	0.30	0.51	0.12	0.06

Table 4.3: Biotite analyses from specimen 11E2. Analyzed grains are labeled numerically with 'r' indicating a rim analysis and 'c' representing a core analysis. T2=biotite in contact with garnet, T3=biotite adjacent to garnet and T4=biotite isolated from garnet in the matrix.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{IV}	Al^{VI}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{o}$	$(X_{Ti})^{oc}$
1r	2	7.70	36.34	18.05	12.94	14.48	0.10	3.51	93.02	0.73	2.72	1.28	0.31	0.81	1.61	0.01	0.20	7.66	0.33	0.67	0.28	0.55	0.10	0.07
1c	2	10.10	39.94	18.11	13.40	15.51	0.00	3.46	100.52	0.90	2.78	1.22	0.27	0.78	1.61	0.00	0.18	7.74	0.33	0.67	0.27	0.57	0.09	0.06
2r	2	4.15	32.95	18.84	15.35	16.11	0.00	2.71	90.11	0.41	2.54	1.46	0.25	0.99	1.85	0.00	0.16	7.65	0.35	0.65	0.30	0.57	0.08	0.05
2c	2	9.40	38.29	17.92	12.64	14.81	0.05	3.30	96.37	0.87	2.77	1.23	0.30	0.77	1.60	0.00	0.18	7.72	0.32	0.68	0.27	0.56	0.11	0.06
3r	2	8.78	36.54	19.21	12.05	14.40	0.05	2.69	93.67	0.83	2.71	1.29	0.39	0.75	1.59	0.00	0.15	7.71	0.32	0.68	0.26	0.55	0.14	0.05
3c	2	8.10	35.16	16.42	12.13	13.89	0.04	2.82	88.80	0.81	2.76	1.24	0.29	0.80	1.63	0.00	0.17	7.71	0.33	0.67	0.28	0.57	0.10	0.06
4r	2	8.40	36.59	17.06	12.51	14.50	0.00	3.23	92.69	0.81	2.76	1.24	0.27	0.79	1.63	0.00	0.18	7.71	0.33	0.67	0.27	0.57	0.09	0.06
4c	2	9.36	38.07	17.82	12.86	14.61	0.00	3.28	95.99	0.87	2.77	1.23	0.30	0.78	1.59	0.00	0.18	7.72	0.33	0.67	0.27	0.56	0.11	0.06
5r	2	8.04	36.75	18.20	12.80	14.47	0.00	3.19	93.84	0.76	2.73	1.27	0.32	0.79	1.60	0.00	0.18	7.68	0.33	0.67	0.27	0.55	0.11	0.06
5c	2	8.25	33.88	15.96	12.19	13.02	0.13	3.07	86.37	0.85	2.75	1.25	0.28	0.83	1.58	0.01	0.19	7.72	0.34	0.66	0.29	0.55	0.10	0.07
6r	2	8.59	36.96	18.01	11.13	15.12	0.14	2.99	92.79	0.82	2.75	1.25	0.34	0.69	1.68	0.01	0.17	7.70	0.29	0.71	0.24	0.58	0.12	0.06
6c	2	9.42	37.70	17.66	11.89	15.12	0.00	3.24	95.02	0.88	2.77	1.23	0.29	0.73	1.65	0.00	0.18	7.73	0.31	0.69	0.26	0.58	0.10	0.06
7r	2	2.04	6.61	3.53	12.93	1.71	0.00	1.83	29.00	0.77	1.95	2.05	0.00	3.19	0.75	0.00	0.41	8.41	0.81	0.19	0.90	0.21	-0.23	0.11
7c	2	8.76	37.26	18.00	12.28	14.64	0.00	2.77	93.71	0.83	2.77	1.23	0.34	0.76	1.62	0.00	0.15	7.71	0.32	0.68	0.26	0.56	0.12	0.05
8r	2	7.11	30.81	14.99	14.43	11.66	0.11	2.66	81.99	0.79	2.68	1.32	0.22	1.05	1.51	0.01	0.17	7.77	0.41	0.59	0.36	0.51	0.07	0.06
8c	2	8.69	36.85	17.21	12.28	14.36	0.00	2.76	92.42	0.84	2.78	1.22	0.31	0.77	1.62	0.00	0.16	7.72	0.32	0.68	0.27	0.57	0.11	0.05
9r	2	5.81	35.97	17.75	13.12	16.00	0.10	2.75	91.40	0.56	2.71	1.29	0.29	0.83	1.80	0.01	0.16	7.63	0.32	0.68	0.27	0.59	0.09	0.05
9c	2	9.33	37.67	17.20	12.26	15.33	0.13	2.85	94.63	0.88	2.78	1.22	0.28	0.76	1.69	0.01	0.16	7.75	0.31	0.69	0.26	0.59	0.10	0.05
10r	2	2.26	0.52	0.21	9.21	0.06	0.06	1.54	13.73	2.47	0.45	3.55	-3.35	6.59	0.08	0.04	0.99	10.70	0.99	0.01	1.53	0.02	-0.78	0.23
10c	2	9.28	37.33	16.68	12.65	15.14	0.00	3.21	94.30	0.88	2.77	1.23	0.23	0.79	1.68	0.00	0.18	7.76	0.32	0.68	0.27	0.58	0.08	0.06
11r	2	1.40	30.60	18.77	16.24	17.65	0.00	1.62	86.67	0.14	2.44	1.56	0.20	1.08	2.10	0.00	0.10	7.65	0.34	0.66	0.31	0.60	0.06	0.03
11c	2	8.60	37.00	16.62	12.20	14.49	0.14	3.22	92.14	0.83	2.80	1.20	0.28	0.77	1.63	0.01	0.18	7.69	0.32	0.68	0.27	0.57	0.10	0.06
12r	2	8.77	36.49	16.82	11.89	14.47	0.12	3.16	91.59	0.85	2.78	1.22	0.28	0.76	1.64	0.01	0.18	7.71	0.32	0.68	0.26	0.57	0.10	0.06
12c	2	9.69	37.87	17.61	11.80	14.78	0.10	2.91	94.66	0.91	2.79	1.21	0.32	0.73	1.62	0.01	0.16	7.74	0.31	0.69	0.26	0.57	0.11	0.06
13c	3	8.41	36.61	17.59	12.31	14.85	0.00	3.05	93.39	0.80	2.73	1.27	0.28	0.77	1.65	0.00	0.17	7.76	0.32	0.68	0.27	0.57	0.10	0.06
14c	3	9.13	36.92	16.79	12.79	14.72	0.29	3.43	93.79	0.87	2.76	1.24	0.24	0.80	1.64	0.02	0.19	7.74	0.33	0.67	0.28	0.57	0.08	0.07
15c	3	9.54	37.52	17.14	12.70	14.67	0.19	3.42	94.98	0.90	2.77	1.23	0.26	0.78	1.61	0.01	0.19	7.75	0.33	0.67	0.28	0.57	0.09	0.07
16c	3	8.96	37.37	17.09	13.31	15.33	0.15	3.11	95.17	0.84	2.75	1.25	0.24	0.82	1.68	0.01	0.17	7.75	0.33	0.67	0.28	0.58	0.08	0.06

17c	3	9.61	37.58	17.05	12.89	14.66	0.08	3.29	95.08	0.90	2.77	1.23	0.26	0.80	1.61	0.01	0.18	7.75	0.33	0.67	0.28	0.57	0.09	0.06
18c	4	9.71	36.73	16.41	12.33	14.47	0.00	3.43	93.08	0.93	2.77	1.23	0.23	0.78	1.63	0.00	0.20	7.77	0.32	0.68	0.27	0.57	0.08	0.07
19c	4	9.09	36.73	16.35	12.66	14.17	0.03	3.56	92.57	0.88	2.78	1.22	0.24	0.80	1.60	0.00	0.20	7.72	0.33	0.67	0.28	0.56	0.08	0.07
20c	4	9.36	37.22	16.71	12.56	14.82	0.03	3.62	94.30	0.89	2.77	1.23	0.23	0.78	1.64	0.00	0.20	7.74	0.32	0.68	0.27	0.58	0.08	0.07
21c	4	9.76	37.78	16.88	12.60	14.78	0.03	3.57	95.37	0.92	2.78	1.22	0.24	0.78	1.62	0.00	0.20	7.75	0.32	0.68	0.27	0.57	0.09	0.07
22c	4	9.09	36.71	17.77	12.21	14.30	0.00	3.31	93.38	0.87	2.74	1.26	0.31	0.76	1.59	0.00	0.19	7.72	0.32	0.68	0.27	0.56	0.11	0.07
23c	3	9.42	37.15	17.22	12.60	15.04	0.32	3.01	94.43	0.89	2.76	1.24	0.26	0.78	1.66	0.02	0.17	7.77	0.32	0.68	0.27	0.58	0.09	0.06
24c	3	9.37	36.78	17.25	12.58	14.15	0.18	3.23	93.35	0.90	2.76	1.24	0.29	0.79	1.58	0.01	0.18	7.74	0.33	0.67	0.28	0.56	0.10	0.06
25c	3	9.56	37.50	16.79	12.28	14.52	0.10	3.05	93.70	0.91	2.80	1.20	0.28	0.77	1.62	0.01	0.17	7.74	0.32	0.68	0.27	0.57	0.10	0.06
26c	4	8.32	35.04	16.95	13.50	13.67	0.00	3.28	90.76	0.82	2.72	1.28	0.26	0.88	1.58	0.00	0.19	7.73	0.36	0.64	0.30	0.54	0.09	0.07
27c	4	9.06	37.72	17.98	12.37	14.81	0.00	3.38	95.31	0.84	2.76	1.24	0.31	0.76	1.61	0.00	0.19	7.71	0.32	0.68	0.26	0.56	0.11	0.06
28c	4	9.67	36.79	17.28	13.36	13.49	0.00	3.37	93.96	0.93	2.76	1.24	0.29	0.84	1.51	0.00	0.19	7.75	0.36	0.64	0.30	0.53	0.10	0.07
29c	4	9.70	37.02	17.29	12.81	14.34	0.17	3.42	94.58	0.92	2.75	1.25	0.27	0.80	1.59	0.01	0.19	7.76	0.33	0.67	0.28	0.56	0.09	0.07
30c	3	9.89	36.28	17.42	12.82	13.80	0.14	3.48	93.69	0.95	2.73	1.27	0.27	0.81	1.55	0.01	0.20	7.78	0.34	0.66	0.29	0.55	0.10	0.07
31c	4	9.73	36.65	17.50	13.32	13.78	0.01	3.44	94.43	0.93	2.74	1.26	0.28	0.83	1.53	0.00	0.19	7.76	0.35	0.65	0.29	0.54	0.10	0.07
32c	4	9.59	36.52	17.42	13.53	13.93	0.13	3.54	94.54	0.91	2.73	1.27	0.26	0.84	1.55	0.01	0.20	7.77	0.35	0.65	0.30	0.54	0.09	0.07

Table 4.4: Biotite analyses from sample 207. Analyzed grains are labeled numerically with 'r' indicating a rim analysis and 'c' representing a core analysis. T2=biotite in contact with garnet, T3=biotite adjacent to garnet and T4=biotite isolated from garnet in the matrix.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{IV}	Al^{VI}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
1r	3	10.00	37.79	19.87	16.73	10.72	0.00	2.87	97.99	0.93	2.75	1.25	0.45	1.02	1.16	0.00	0.16	7.71	0.47	0.53	0.37	0.42	0.16	0.06
1c	3	10.12	37.54	19.86	17.19	10.53	0.00	3.22	98.47	0.94	2.72	1.28	0.42	1.04	1.14	0.00	0.18	7.72	0.48	0.52	0.38	0.41	0.15	0.06
2r	2	9.76	36.95	19.56	15.99	10.17	0.26	3.16	95.58	0.93	2.75	1.25	0.46	0.99	1.13	0.02	0.18	7.68	0.47	0.53	0.36	0.41	0.17	0.06
2c	2	10.10	38.46	19.66	16.96	9.93	0.00	3.56	98.67	0.93	2.77	1.23	0.45	1.02	1.07	0.00	0.19	7.66	0.49	0.51	0.37	0.39	0.16	0.07
3r	2	9.47	37.06	19.75	16.43	10.20	0.12	2.72	95.63	0.90	2.75	1.25	0.48	1.02	1.13	0.01	0.15	7.68	0.47	0.53	0.37	0.41	0.17	0.05
3c	2	10.10	37.43	19.54	17.16	10.29	0.06	2.92	97.44	0.95	2.75	1.25	0.44	1.05	1.12	0.00	0.16	7.72	0.48	0.52	0.38	0.41	0.16	0.06
4r	2	9.67	37.28	20.18	17.17	10.63	0.00	2.91	97.84	0.90	2.72	1.28	0.45	1.05	1.15	0.00	0.16	7.71	0.48	0.52	0.37	0.41	0.16	0.06
4c	2	10.19	36.89	19.83	16.86	9.61	0.04	3.26	96.64	0.96	2.73	1.27	0.46	1.04	1.06	0.00	0.18	7.71	0.50	0.50	0.38	0.39	0.17	0.07
5c	3	10.07	36.88	18.45	17.71	10.05	0.00	3.33	96.48	0.96	2.75	1.25	0.37	1.10	1.12	0.00	0.19	7.73	0.50	0.50	0.40	0.40	0.13	0.07
6r	3	9.99	36.82	19.06	16.59	9.74	0.00	3.32	95.52	0.95	2.75	1.25	0.43	1.04	1.09	0.00	0.19	7.70	0.49	0.51	0.38	0.40	0.16	0.07
6c	3	10.01	36.78	19.02	17.36	9.75	0.21	3.73	96.64	0.95	2.73	1.27	0.39	1.08	1.08	0.01	0.21	7.70	0.50	0.50	0.39	0.39	0.14	0.08
7c	4	10.02	37.52	19.31	18.16	10.27	0.00	3.78	99.06	0.93	2.72	1.28	0.37	1.10	1.11	0.00	0.21	7.71	0.50	0.50	0.40	0.40	0.13	0.07
8c	4	10.05	36.79	19.25	16.96	9.87	0.07	3.53	96.45	0.95	2.73	1.27	0.41	1.05	1.09	0.00	0.20	7.71	0.49	0.51	0.38	0.40	0.15	0.07
9c	4	10.02	37.59	19.14	17.94	10.14	0.02	3.45	98.28	0.93	2.74	1.26	0.39	1.10	1.10	0.00	0.19	7.71	0.50	0.50	0.39	0.40	0.14	0.07
10c	4	9.95	37.44	18.93	17.57	10.10	0.00	3.17	97.17	0.94	2.76	1.24	0.40	1.08	1.11	0.00	0.18	7.71	0.49	0.51	0.39	0.40	0.15	0.06
11c	4	10.43	38.59	20.00	16.61	10.48	0.07	3.39	99.50	0.95	2.76	1.24	0.45	0.99	1.12	0.00	0.18	7.69	0.47	0.53	0.36	0.41	0.16	0.07
12c	4	9.88	36.74	18.84	17.23	9.81	0.24	3.14	95.65	0.94	2.75	1.25	0.42	1.08	1.10	0.02	0.18	7.71	0.50	0.50	0.39	0.40	0.15	0.06
13c	4	10.23	37.05	18.95	16.82	9.83	0.07	3.53	96.42	0.97	2.75	1.25	0.41	1.04	1.09	0.00	0.20	7.71	0.49	0.51	0.38	0.40	0.15	0.07
14c	4	10.13	37.01	18.69	17.87	10.02	0.00	3.46	97.19	0.96	2.74	1.26	0.37	1.11	1.11	0.00	0.19	7.73	0.50	0.50	0.40	0.40	0.13	0.07
15c	4	10.36	37.11	19.13	17.08	10.25	0.02	3.31	97.23	0.97	2.74	1.26	0.40	1.05	1.13	0.00	0.18	7.74	0.48	0.52	0.38	0.41	0.14	0.07
16c	4	9.94	37.55	19.24	17.01	10.09	0.04	3.54	97.37	0.93	2.75	1.25	0.42	1.04	1.10	0.00	0.20	7.69	0.49	0.51	0.38	0.40	0.15	0.07
17c	4	10.23	37.31	19.08	16.66	9.58	0.10	3.55	96.41	0.97	2.77	1.23	0.43	1.03	1.06	0.01	0.20	7.69	0.49	0.51	0.38	0.39	0.16	0.07
18c	4	10.29	36.72	19.26	16.70	9.77	0.10	3.21	95.95	0.98	2.74	1.26	0.43	1.04	1.09	0.01	0.18	7.72	0.49	0.51	0.38	0.40	0.16	0.07
19c	4	9.93	36.92	19.48	16.65	9.57	0.11	3.46	96.00	0.94	2.74	1.26	0.45	1.03	1.06	0.01	0.19	7.68	0.49	0.51	0.38	0.39	0.16	0.07
20c	4	9.72	36.55	19.54	17.13	9.83	0.07	3.33	96.09	0.92	2.72	1.28	0.43	1.07	1.09	0.00	0.19	7.70	0.49	0.51	0.38	0.39	0.16	0.07
21c	4	10.00	36.87	19.48	17.11	9.86	0.02	3.43	96.75	0.94	2.73	1.27	0.43	1.06	1.09	0.00	0.19	7.71	0.49	0.51	0.38	0.39	0.15	0.07

Table 4.5: Biotite analyses from sample 208. Analyzed grains are labeled numerically with 'r' indicating a rim analysis and 'c' representing a core analysis. T2=biotite in contact with garnet, T3=biotite adjacent to garnet and T4=biotite isolated from garnet in the matrix.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{IV}	Al^{VI}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
1r	2	9.71	35.91	18.62	21.46	8.77	0.11	2.50	96.98	0.94	2.71	1.29	0.37	1.35	0.99	0.01	0.14	7.79	0.58	0.42	0.48	0.35	0.13	0.05
1c	2	9.55	36.66	18.57	22.21	8.91	0.00	2.42	98.31	0.91	2.73	1.27	0.36	1.38	0.99	0.00	0.14	7.77	0.58	0.42	0.48	0.34	0.13	0.05
2r	2	9.61	36.76	20.04	19.89	9.66	0.35	2.02	97.98	0.90	2.71	1.29	0.45	1.23	1.06	0.02	0.11	7.76	0.54	0.46	0.43	0.37	0.16	0.04
2c	2	9.50	37.04	19.74	20.07	9.59	0.00	1.98	97.92	0.89	2.73	1.27	0.45	1.24	1.05	0.00	0.11	7.75	0.54	0.46	0.43	0.37	0.16	0.04
3r	3	9.06	36.18	17.40	19.80	10.28	0.22	2.72	95.44	0.88	2.75	1.25	0.30	1.26	1.16	0.01	0.16	7.76	0.52	0.48	0.44	0.40	0.11	0.05
3c	3	9.65	36.88	18.33	18.94	10.07	0.14	3.31	97.16	0.91	2.74	1.26	0.34	1.18	1.11	0.01	0.18	7.73	0.51	0.49	0.42	0.40	0.12	0.07
4r	2	9.11	37.41	18.95	19.61	9.79	0.09	1.65	96.50	0.87	2.79	1.21	0.45	1.22	1.09	0.01	0.09	7.72	0.53	0.47	0.43	0.38	0.16	0.03
4c	2	8.86	38.08	18.85	18.26	11.42	0.00	1.63	97.10	0.83	2.79	1.21	0.42	1.12	1.25	0.00	0.09	7.72	0.47	0.53	0.39	0.43	0.15	0.03
5r	2	8.65	35.42	17.62	19.14	9.21	0.11	2.61	92.65	0.86	2.76	1.24	0.38	1.25	1.07	0.01	0.15	7.71	0.54	0.46	0.44	0.38	0.13	0.05
5c	2	9.85	37.41	18.21	19.09	9.72	0.00	3.08	97.36	0.93	2.77	1.23	0.36	1.18	1.07	0.00	0.17	7.73	0.52	0.48	0.42	0.38	0.13	0.06
6r	2	9.78	36.97	18.10	20.42	9.62	0.30	2.87	97.77	0.93	2.75	1.25	0.34	1.27	1.07	0.02	0.16	7.76	0.54	0.46	0.45	0.38	0.12	0.06
7r	2	9.49	37.15	19.21	18.99	10.25	0.27	2.33	97.43	0.89	2.74	1.26	0.41	1.17	1.13	0.02	0.13	7.74	0.51	0.49	0.41	0.40	0.15	0.05
7c	2	9.75	36.97	18.54	19.19	9.50	0.11	2.90	96.85	0.93	2.76	1.24	0.39	1.20	1.06	0.01	0.16	7.73	0.53	0.47	0.43	0.38	0.14	0.06
8r	2	9.65	36.32	18.06	19.72	9.05	0.03	3.30	96.11	0.93	2.74	1.26	0.35	1.25	1.02	0.00	0.19	7.73	0.55	0.45	0.44	0.36	0.12	0.07
8c	2	9.54	36.77	18.09	19.31	9.92	0.04	3.35	96.98	0.91	2.74	1.26	0.33	1.20	1.10	0.00	0.19	7.73	0.52	0.48	0.43	0.39	0.12	0.07
9c	3	9.68	36.75	18.01	18.67	10.02	0.12	3.48	96.61	0.92	2.74	1.26	0.33	1.17	1.12	0.01	0.20	7.73	0.51	0.49	0.42	0.40	0.12	0.07
10c	4	9.98	37.27	18.40	19.94	10.10	0.03	3.59	99.29	0.93	2.72	1.28	0.31	1.22	1.10	0.00	0.20	7.75	0.53	0.47	0.43	0.39	0.11	0.07
11c	4	9.48	37.88	18.23	19.27	10.21	0.10	3.30	98.36	0.88	2.77	1.23	0.34	1.18	1.11	0.01	0.18	7.70	0.51	0.49	0.42	0.39	0.12	0.06
12c	4	9.50	36.11	17.51	19.26	9.00	0.12	2.80	94.18	0.93	2.78	1.22	0.37	1.24	1.03	0.01	0.16	7.73	0.55	0.45	0.44	0.37	0.13	0.06
13c	4	9.42	35.38	17.49	19.13	9.71	0.15	3.06	94.20	0.93	2.73	1.27	0.31	1.23	1.12	0.01	0.18	7.77	0.52	0.48	0.43	0.39	0.11	0.06
14c	4	10.05	37.30	18.44	19.90	9.88	0.18	3.41	98.99	0.94	2.73	1.27	0.33	1.22	1.08	0.01	0.19	7.75	0.53	0.47	0.43	0.38	0.12	0.07
15c	4	9.86	37.17	18.12	19.61	10.11	0.24	3.02	97.90	0.93	2.75	1.25	0.33	1.21	1.12	0.02	0.17	7.76	0.52	0.48	0.43	0.39	0.12	0.06
16c	4	9.57	36.22	17.62	20.54	9.83	0.14	3.45	97.23	0.92	2.72	1.28	0.27	1.29	1.10	0.01	0.19	7.77	0.54	0.46	0.45	0.39	0.10	0.07
17c	4	9.82	37.64	18.29	19.21	9.59	0.20	3.50	98.06	0.92	2.77	1.23	0.36	1.18	1.05	0.01	0.19	7.70	0.53	0.47	0.42	0.38	0.13	0.07
18c	4	9.70	37.23	18.17	19.19	9.72	0.28	3.20	97.21	0.92	2.76	1.24	0.36	1.19	1.08	0.02	0.18	7.72	0.53	0.47	0.43	0.38	0.13	0.06
19c	4	9.99	37.60	18.11	19.19	10.26	0.21	3.28	98.44	0.94	2.76	1.24	0.33	1.18	1.12	0.01	0.18	7.74	0.51	0.49	0.42	0.40	0.12	0.06
20c	4	9.54	38.03	18.56	18.45	10.14	0.37	3.53	98.25	0.89	2.77	1.23	0.37	1.13	1.10	0.02	0.19	7.68	0.51	0.49	0.40	0.39	0.13	0.07
21c	4	9.72	37.22	17.91	18.59	10.15	0.20	3.70	97.30	0.92	2.76	1.24	0.32	1.15	1.12	0.01	0.21	7.71	0.51	0.49	0.41	0.40	0.11	0.07

Table 4.6: Biotite analyses from sample 282. Analyzed grains are labeled numerically with 'r' indicating a rim analysis and 'c' representing a core analysis. T1=biotite included in garnet, T2=biotite in contact with garnet, T3=biotite adjacent to garnet and T4=biotite isolated from garnet in the matrix.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{IV}	Al^{VI}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{o}$
1r	1	8.19	34.90	17.67	18.52	11.03	0.00	3.64	94.18	0.80	2.67	1.33	0.26	1.18	1.26	0.00	0.21	7.74	0.49	0.51	0.41	0.43	0.09	0.07
1c	1	8.83	36.44	18.50	17.29	10.63	0.07	3.81	95.68	0.84	2.72	1.28	0.35	1.08	1.18	0.00	0.21	7.67	0.48	0.52	0.38	0.42	0.12	0.08
2r	1	8.45	35.32	19.29	16.16	10.16	0.26	3.70	93.33	0.82	2.69	1.31	0.42	1.03	1.15	0.02	0.21	7.65	0.47	0.53	0.37	0.41	0.15	0.08
2c	1	9.50	36.04	17.90	16.90	10.63	0.10	4.17	95.13	0.91	2.71	1.29	0.30	1.06	1.19	0.01	0.24	7.71	0.47	0.53	0.38	0.43	0.11	0.08
3r	1	6.07	34.12	21.18	18.24	9.49	0.14	2.32	91.87	0.60	2.63	1.37	0.55	1.17	1.09	0.01	0.13	7.58	0.52	0.48	0.40	0.37	0.19	0.05
3c	1	9.25	35.27	19.07	16.12	11.00	0.04	3.70	94.71	0.89	2.66	1.34	0.35	1.02	1.24	0.00	0.21	7.75	0.45	0.55	0.36	0.44	0.13	0.07
4r	1	9.12	36.02	20.59	15.41	11.78	0.06	4.15	97.08	0.85	2.62	1.38	0.39	0.94	1.28	0.00	0.23	7.69	0.42	0.58	0.33	0.45	0.14	0.08
4c	1	9.52	35.89	18.85	16.05	11.15	0.00	4.29	95.74	0.90	2.67	1.33	0.33	1.00	1.24	0.00	0.24	7.71	0.45	0.55	0.36	0.44	0.12	0.09
5r	1	8.32	36.62	21.64	15.56	12.17	0.06	3.45	98.29	0.76	2.62	1.38	0.45	0.93	1.30	0.00	0.19	7.69	0.42	0.58	0.33	0.45	0.16	0.06
5c	1	9.60	35.73	18.23	15.70	11.40	0.03	3.97	94.87	0.92	2.69	1.31	0.31	0.99	1.28	0.00	0.22	7.76	0.44	0.56	0.35	0.46	0.11	0.08
6r	1	9.18	35.43	19.10	16.20	10.49	0.08	3.62	94.27	0.89	2.68	1.32	0.38	1.03	1.18	0.01	0.21	7.72	0.46	0.54	0.37	0.42	0.14	0.07
6c	1	9.42	35.45	17.96	17.57	10.42	0.00	3.66	94.48	0.92	2.70	1.30	0.31	1.12	1.18	0.00	0.21	7.74	0.49	0.51	0.40	0.42	0.11	0.07
7r	2	8.96	36.56	19.67	13.87	13.39	0.04	3.25	95.70	0.84	2.68	1.32	0.38	0.85	1.46	0.00	0.18	7.71	0.37	0.63	0.30	0.51	0.13	0.06
7c	2	9.30	35.59	18.43	13.22	12.69	0.00	3.33	92.81	0.90	2.70	1.30	0.35	0.84	1.44	0.00	0.19	7.75	0.37	0.63	0.30	0.51	0.12	0.07
8c	3	9.70	35.62	18.19	16.09	10.99	0.00	4.03	94.62	0.94	2.69	1.31	0.31	1.02	1.24	0.00	0.23	7.74	0.45	0.55	0.36	0.44	0.11	0.08
9c	3	9.59	35.89	18.15	16.12	10.99	0.00	3.44	94.41	0.93	2.72	1.28	0.34	1.02	1.24	0.00	0.20	7.76	0.45	0.55	0.37	0.44	0.12	0.07
10c	3	9.67	35.86	18.02	16.33	10.82	0.04	4.29	95.32	0.93	2.70	1.30	0.29	1.03	1.21	0.00	0.24	7.75	0.46	0.54	0.37	0.44	0.11	0.09
11c	3	9.61	35.43	18.06	16.38	10.69	0.00	4.30	94.47	0.93	2.69	1.31	0.30	1.04	1.21	0.00	0.25	7.73	0.46	0.54	0.37	0.43	0.11	0.09
12c	4	9.73	35.60	18.21	16.37	10.76	0.00	4.02	94.68	0.94	2.69	1.31	0.32	1.04	1.21	0.00	0.23	7.74	0.46	0.54	0.37	0.43	0.11	0.08
13c	4	9.74	35.85	18.20	16.58	10.75	0.00	4.39	95.51	0.93	2.69	1.31	0.30	1.04	1.20	0.00	0.25	7.72	0.46	0.54	0.37	0.43	0.11	0.09
14c	4	9.48	35.51	18.53	16.09	10.46	0.00	4.27	94.62	0.91	2.68	1.32	0.33	1.02	1.18	0.00	0.24	7.73	0.46	0.54	0.37	0.43	0.12	0.09
16c	4	9.18	35.98	18.30	16.91	10.59	0.00	4.14	95.11	0.88	2.70	1.30	0.33	1.06	1.19	0.00	0.23	7.69	0.47	0.53	0.38	0.42	0.12	0.08
17c	4	9.80	35.50	18.41	16.27	10.31	0.00	4.40	94.95	0.94	2.68	1.32	0.32	1.03	1.16	0.00	0.25	7.74	0.47	0.53	0.37	0.42	0.12	0.09
18c	4	9.58	35.36	18.04	16.59	10.47	0.00	4.27	94.30	0.93	2.69	1.31	0.31	1.06	1.19	0.00	0.24	7.72	0.47	0.53	0.38	0.42	0.11	0.09
19c	4	9.78	35.98	18.75	16.58	10.92	0.11	4.19	96.63	0.93	2.67	1.33	0.31	1.03	1.21	0.01	0.23	7.77	0.46	0.54	0.37	0.43	0.11	0.08
20c	4	9.75	34.43	17.72	15.86	10.01	0.10	3.85	92.04	0.97	2.69	1.31	0.32	1.04	1.17	0.01	0.23	7.79	0.47	0.53	0.38	0.42	0.12	0.08
21r	2	9.33	36.01	19.01	15.56	10.79	0.09	4.30	95.01	0.89	2.69	1.31	0.37	0.97	1.20	0.01	0.24	7.67	0.45	0.55	0.35	0.43	0.13	0.09

21c	2	9.64	35.61	18.48	15.58	11.08	0.01	4.25	94.65	0.93	2.68	1.32	0.32	0.98	1.24	0.00	0.24	7.72	0.44	0.56	0.35	0.45	0.12	0.09
22c	3	9.71	35.54	18.00	16.48	10.63	0.12	3.90	94.26	0.94	2.70	1.30	0.32	1.05	1.21	0.01	0.22	7.74	0.47	0.53	0.38	0.43	0.11	0.08
22r	3	9.70	35.99	18.51	16.00	11.15	0.00	4.06	95.69	0.92	2.69	1.31	0.32	1.00	1.24	0.00	0.23	7.75	0.45	0.55	0.36	0.45	0.11	0.08
23c	2	9.00	33.69	16.75	16.42	9.92	0.04	4.01	89.79	0.92	2.70	1.30	0.28	1.10	1.18	0.00	0.24	7.73	0.48	0.52	0.39	0.42	0.10	0.09
24r	2	9.35	35.63	18.97	17.05	10.64	0.12	4.24	95.87	0.89	2.66	1.34	0.33	1.06	1.19	0.01	0.24	7.71	0.47	0.53	0.38	0.42	0.12	0.08
24c	2	9.83	35.13	17.87	15.90	10.29	0.00	4.49	93.74	0.96	2.69	1.31	0.30	1.02	1.17	0.00	0.26	7.74	0.46	0.54	0.37	0.43	0.11	0.09
25c	2	8.97	32.61	19.63	14.63	10.35	0.00	4.38	90.56	0.90	2.56	1.44	0.38	0.96	1.21	0.00	0.26	7.72	0.44	0.56	0.34	0.43	0.14	0.09
27c	3	9.30	35.27	17.50	15.61	10.71	0.02	4.08	93.40	0.91	2.70	1.30	0.29	1.00	1.22	0.00	0.24	7.79	0.45	0.55	0.36	0.45	0.10	0.09
28c	3	9.42	34.25	17.84	15.83	10.26	0.12	4.49	92.10	0.93	2.67	1.33	0.30	1.03	1.19	0.01	0.26	7.72	0.46	0.54	0.37	0.43	0.11	0.09
29c	4	9.53	33.74	17.13	16.56	9.80	0.04	4.48	91.51	0.96	2.66	1.34	0.26	1.09	1.15	0.00	0.27	7.77	0.49	0.51	0.39	0.42	0.09	0.10
30c	4	9.67	36.24	18.72	16.36	10.80	0.00	4.00	96.03	0.92	2.70	1.30	0.34	1.02	1.20	0.00	0.22	7.73	0.46	0.54	0.37	0.43	0.12	0.08
31c	4	9.59	36.29	18.14	16.14	10.78	0.04	4.25	95.19	0.92	2.72	1.28	0.32	1.01	1.20	0.00	0.24	7.70	0.46	0.54	0.36	0.43	0.12	0.09
32c	4	9.72	35.61	18.13	16.24	10.38	0.03	3.98	94.06	0.94	2.71	1.29	0.34	1.03	1.18	0.00	0.23	7.72	0.47	0.53	0.37	0.42	0.12	0.08
33c	4	9.25	35.68	18.26	16.79	10.33	0.03	4.57	95.16	0.89	2.69	1.31	0.31	1.06	1.16	0.00	0.26	7.71	0.48	0.52	0.38	0.42	0.11	0.09
34c	4	9.67	35.41	18.49	16.15	10.51	0.00	3.97	94.19	0.94	2.69	1.31	0.35	1.03	1.19	0.00	0.23	7.72	0.46	0.54	0.37	0.43	0.12	0.08
35c	4	9.63	36.01	18.10	16.51	10.65	0.08	4.36	95.25	0.92	2.71	1.29	0.31	1.04	1.19	0.00	0.25	7.71	0.47	0.53	0.37	0.43	0.11	0.09
36c	4	9.84	35.75	18.39	16.54	10.26	0.00	4.28	95.31	0.94	2.69	1.31	0.32	1.04	1.15	0.00	0.24	7.74	0.47	0.53	0.38	0.42	0.12	0.09
37c	4	9.67	36.03	18.90	16.22	10.53	0.06	3.78	95.14	0.93	2.70	1.30	0.37	1.02	1.18	0.00	0.21	7.71	0.46	0.54	0.37	0.42	0.13	0.08
38c	4	9.74	35.77	18.59	16.26	10.60	0.04	4.09	95.33	0.93	2.69	1.31	0.33	1.02	1.19	0.00	0.23	7.75	0.46	0.54	0.37	0.43	0.12	0.08
39c	4	9.48	35.18	17.71	16.34	9.92	0.00	4.17	92.80	0.93	2.72	1.28	0.33	1.06	1.14	0.00	0.24	7.70	0.48	0.52	0.38	0.41	0.12	0.09
40c	4	9.60	37.09	19.39	16.09	10.77	0.00	4.63	97.57	0.89	2.70	1.30	0.37	0.98	1.17	0.00	0.25	7.66	0.46	0.54	0.35	0.42	0.13	0.09

Table 4.7: Biotite analyses from sample 288. Analyzed grains are labeled numerically with ‘r’ indicating a rim analysis and ‘c’ representing a core analysis. T1=biotite included in garnet, T2=biotite in contact with garnet, T3=biotite adjacent to garnet and T4=biotite isolated from garnet in the matrix.

		Oxide percentage								Cations on an 11(O) basis											Proportion in the oct. site			
#	Type	K_2O	SiO_2	Al_2O_3	FeO	MgO	MnO	TiO_2	Total	K	Si	Al^{IV}	Al^{VI}	Fe	Mg	Mn	Ti	Total	X_{Fe}	X_{Mg}	$(X_{Fe})^{oc}$	$(X_{Mg})^{oc}$	$(X_{AlVI})^{oc}$	$(X_{Ti})^{oc}$
1r	1	8.84	36.21	18.87	15.32	12.53	0.00	2.94	94.72	0.84	2.70	1.30	0.36	0.96	1.39	0.00	0.17	7.72	0.41	0.59	0.33	0.48	0.13	0.06
1c	1	8.02	36.75	19.65	16.65	11.30	0.05	2.52	95.06	0.76	2.73	1.27	0.45	1.03	1.25	0.00	0.14	7.65	0.45	0.55	0.36	0.43	0.16	0.05
2r	1	9.61	36.09	18.31	16.68	10.96	0.09	4.31	95.96	0.91	2.69	1.31	0.30	1.04	1.22	0.01	0.24	7.72	0.46	0.54	0.37	0.43	0.11	0.09
2c	1	9.18	37.21	18.67	16.54	11.29	0.12	4.30	97.18	0.86	2.72	1.28	0.33	1.01	1.23	0.01	0.24	7.67	0.45	0.55	0.36	0.44	0.12	0.08
3c	1	9.68	36.55	18.30	17.05	10.81	0.08	3.74	96.14	0.92	2.72	1.28	0.33	1.06	1.20	0.01	0.21	7.72	0.47	0.53	0.38	0.43	0.12	0.07
4r	1	9.25	36.23	18.26	16.83	10.72	0.02	3.52	94.81	0.89	2.73	1.27	0.35	1.06	1.20	0.00	0.20	7.70	0.47	0.53	0.38	0.43	0.12	0.07
4c	1	8.82	36.74	19.38	16.92	11.07	0.03	3.63	96.55	0.83	2.70	1.30	0.38	1.04	1.21	0.00	0.20	7.67	0.46	0.54	0.37	0.43	0.14	0.07
5r	1	9.71	36.31	18.36	17.43	10.52	0.08	3.48	95.81	0.93	2.72	1.28	0.34	1.09	1.18	0.00	0.20	7.74	0.48	0.52	0.39	0.42	0.12	0.07
5c	1	9.60	35.63	17.94	17.90	10.53	0.01	3.56	95.16	0.93	2.70	1.30	0.30	1.13	1.19	0.00	0.20	7.76	0.49	0.51	0.40	0.42	0.11	0.07
6c	1	9.54	35.98	18.29	17.35	10.50	0.09	3.87	95.54	0.92	2.70	1.30	0.32	1.09	1.18	0.01	0.22	7.72	0.48	0.52	0.39	0.42	0.12	0.08
7r	1	8.69	36.69	18.78	19.03	10.85	0.12	3.60	97.64	0.82	2.70	1.30	0.32	1.17	1.19	0.01	0.20	7.70	0.50	0.50	0.41	0.41	0.11	0.07
7c	1	9.46	35.67	17.91	17.81	10.44	0.17	3.76	95.05	0.91	2.70	1.30	0.30	1.13	1.18	0.01	0.21	7.74	0.49	0.51	0.40	0.42	0.11	0.08
8r	1	8.00	36.50	18.34	15.44	10.65	0.05	2.76	92.23	0.78	2.79	1.21	0.44	0.99	1.21	0.00	0.16	7.64	0.45	0.55	0.35	0.43	0.16	0.06
8c	1	9.19	35.14	18.25	16.81	10.83	0.00	3.29	93.50	0.90	2.69	1.31	0.34	1.08	1.24	0.00	0.19	7.74	0.47	0.53	0.38	0.43	0.12	0.07
9r	2	8.77	34.37	18.08	15.39	11.06	0.07	3.43	91.11	0.87	2.68	1.32	0.35	1.01	1.29	0.00	0.20	7.72	0.44	0.56	0.35	0.45	0.12	0.07
9c	2	9.34	36.47	19.04	15.11	12.04	0.07	3.62	95.62	0.88	2.70	1.30	0.36	0.94	1.33	0.00	0.20	7.71	0.41	0.59	0.33	0.47	0.13	0.07
10c	3	9.55	35.60	17.88	18.36	10.29	0.06	3.93	95.62	0.92	2.69	1.31	0.28	1.16	1.16	0.00	0.22	7.75	0.50	0.50	0.41	0.41	0.10	0.08
12c	4	9.37	36.08	17.83	18.60	9.00	0.02	4.09	94.98	0.91	2.74	1.26	0.34	1.18	1.02	0.00	0.23	7.68	0.54	0.46	0.43	0.37	0.12	0.08
13c	4	9.80	35.48	17.41	19.37	9.32	0.10	4.36	95.75	0.95	2.70	1.30	0.26	1.23	1.06	0.01	0.25	7.75	0.54	0.46	0.44	0.38	0.09	0.09
14c	4	9.89	34.95	17.17	18.62	9.33	0.05	4.33	94.28	0.97	2.70	1.30	0.26	1.20	1.07	0.00	0.25	7.76	0.53	0.47	0.43	0.39	0.09	0.09
15c	4	9.82	35.61	17.48	18.70	9.63	0.06	4.32	95.56	0.95	2.70	1.30	0.27	1.19	1.09	0.00	0.25	7.74	0.52	0.48	0.43	0.39	0.10	0.09
16c	4	9.84	35.08	17.03	19.01	9.24	0.08	4.49	95.06	0.96	2.69	1.31	0.23	1.22	1.06	0.01	0.26	7.79	0.54	0.46	0.44	0.38	0.08	0.09
17c	4	9.70	35.17	17.24	18.83	9.40	0.00	4.13	94.47	0.95	2.71	1.29	0.27	1.21	1.08	0.00	0.24	7.75	0.53	0.47	0.43	0.39	0.10	0.09
18c	4	9.31	37.15	18.86	16.77	8.62	0.09	3.89	94.59	0.89	2.79	1.21	0.46	1.05	0.97	0.01	0.22	7.60	0.52	0.48	0.39	0.36	0.17	0.08
19c	4	10.00	35.64	18.01	18.89	9.21	0.02	4.13	96.28	0.96	2.69	1.31	0.30	1.19	1.04	0.00	0.23	7.78	0.54	0.46	0.43	0.38	0.11	0.08
20c	4	9.71	35.07	17.89	18.89	9.07	0.01	4.24	94.87	0.95	2.69	1.31	0.30	1.21	1.03	0.00	0.24	7.74	0.54	0.46	0.43	0.37	0.11	0.09
21c	4	9.58	35.69	17.45	18.73	9.44	0.00	4.55	95.45	0.93	2.71	1.29	0.27	1.19	1.07	0.00	0.26	7.71	0.53	0.47	0.43	0.38	0.10	0.09

22c	4	9.14	35.02	17.39	19.12	9.11	0.00	4.39	94.17	0.90	2.70	1.30	0.28	1.23	1.05	0.00	0.25	7.71	0.54	0.46	0.44	0.37	0.10	0.09
23c	4	9.75	35.70	17.30	19.00	9.39	0.06	4.69	95.84	0.94	2.71	1.29	0.25	1.20	1.06	0.00	0.27	7.73	0.53	0.47	0.43	0.38	0.09	0.10
25c	4	9.72	35.85	17.84	18.68	9.44	0.20	4.38	95.90	0.94	2.71	1.29	0.29	1.18	1.06	0.01	0.25	7.72	0.53	0.47	0.42	0.38	0.11	0.09
26c	4	9.70	36.53	18.46	18.56	9.88	0.14	4.49	97.62	0.91	2.70	1.30	0.31	1.15	1.09	0.01	0.25	7.71	0.51	0.49	0.41	0.39	0.11	0.09
28c	3	9.28	34.99	18.00	17.76	10.43	0.03	3.16	93.63	0.91	2.69	1.31	0.33	1.14	1.20	0.00	0.18	7.76	0.49	0.51	0.40	0.42	0.11	0.06
29c	3	9.10	34.47	17.95	17.16	9.85	0.01	3.12	91.64	0.91	2.70	1.30	0.36	1.13	1.15	0.00	0.18	7.74	0.49	0.51	0.40	0.41	0.13	0.07
31c	4	9.66	37.02	18.89	18.42	10.18	0.00	4.13	98.29	0.90	2.71	1.29	0.34	1.13	1.11	0.00	0.23	7.70	0.50	0.50	0.40	0.40	0.12	0.08
32c	4	9.31	36.18	18.22	17.00	10.65	0.00	3.22	94.58	0.90	2.74	1.26	0.36	1.08	1.20	0.00	0.18	7.72	0.47	0.53	0.38	0.43	0.13	0.06
33c	4	9.64	35.30	17.68	18.63	9.33	0.04	4.30	94.87	0.94	2.70	1.30	0.29	1.19	1.06	0.00	0.25	7.73	0.53	0.47	0.43	0.38	0.10	0.09
34c	4	10.10	35.84	17.98	18.53	9.81	0.07	4.17	96.45	0.97	2.69	1.31	0.29	1.16	1.10	0.00	0.24	7.76	0.51	0.49	0.42	0.39	0.10	0.08
35c	4	9.38	35.83	18.13	18.60	9.88	0.08	3.82	95.64	0.90	2.70	1.30	0.32	1.17	1.11	0.01	0.22	7.72	0.51	0.49	0.42	0.39	0.11	0.08
36c	4	9.98	35.86	17.92	19.48	8.89	0.12	4.25	96.38	0.96	2.71	1.29	0.30	1.23	1.00	0.01	0.24	7.73	0.55	0.45	0.44	0.36	0.11	0.09
38c	4	9.93	35.98	18.61	18.24	8.84	0.00	4.70	96.61	0.95	2.69	1.31	0.33	1.14	0.99	0.00	0.26	7.72	0.54	0.46	0.42	0.36	0.12	0.10
39c	4	9.70	35.38	17.42	18.95	8.70	0.10	4.68	94.84	0.95	2.71	1.29	0.28	1.21	0.99	0.01	0.27	7.71	0.55	0.45	0.44	0.36	0.10	0.10
40c	4	9.62	35.75	18.05	18.85	8.65	0.05	4.55	95.47	0.93	2.71	1.29	0.32	1.20	0.98	0.00	0.26	7.69	0.55	0.45	0.43	0.35	0.12	0.09
41c	4	9.69	35.18	17.44	19.21	8.99	0.16	4.21	94.71	0.95	2.70	1.30	0.28	1.23	1.03	0.01	0.24	7.74	0.55	0.45	0.44	0.37	0.10	0.09
42r	1	9.11	36.46	18.94	16.84	11.16	0.00	3.11	95.63	0.87	2.72	1.28	0.38	1.05	1.24	0.00	0.17	7.71	0.46	0.54	0.37	0.44	0.13	0.06
42c	1	8.27	35.40	18.46	16.68	10.62	0.00	2.82	92.41	0.81	2.72	1.28	0.40	1.07	1.22	0.00	0.16	7.68	0.47	0.53	0.38	0.43	0.14	0.06
43c	1	9.52	36.51	18.66	16.57	11.48	0.15	3.17	95.90	0.90	2.72	1.28	0.35	1.03	1.27	0.01	0.18	7.74	0.45	0.55	0.36	0.45	0.12	0.06
44c	3	9.71	35.98	18.19	17.29	10.77	0.02	3.36	95.31	0.93	2.71	1.29	0.33	1.09	1.21	0.00	0.19	7.76	0.47	0.53	0.39	0.43	0.12	0.07
45c	4	9.91	35.85	18.19	17.72	9.71	0.06	4.24	95.62	0.95	2.70	1.30	0.32	1.12	1.09	0.00	0.24	7.72	0.51	0.49	0.40	0.39	0.12	0.09
46c	4	9.81	35.87	17.96	18.40	9.36	0.06	4.33	95.71	0.95	2.71	1.29	0.31	1.16	1.05	0.00	0.25	7.72	0.52	0.48	0.42	0.38	0.11	0.09
47c	4	10.04	36.08	18.13	18.65	9.42	0.01	4.40	96.71	0.96	2.70	1.30	0.30	1.17	1.05	0.00	0.25	7.73	0.53	0.47	0.42	0.38	0.11	0.09
48c	4	9.86	36.11	18.07	17.98	10.16	0.00	3.87	96.04	0.94	2.71	1.29	0.31	1.13	1.14	0.00	0.22	7.74	0.50	0.50	0.40	0.41	0.11	0.08
50c	4	9.94	35.21	17.70	18.45	9.05	0.01	4.41	94.76	0.97	2.70	1.30	0.30	1.18	1.03	0.00	0.25	7.74	0.53	0.47	0.43	0.37	0.11	0.09
51c	4	9.45	35.68	17.80	18.35	9.44	0.09	4.29	95.01	0.92	2.71	1.29	0.31	1.17	1.07	0.01	0.25	7.70	0.52	0.48	0.42	0.38	0.11	0.09
52c	4	10.13	36.99	18.88	18.56	9.74	0.10	4.42	98.71	0.94	2.70	1.30	0.33	1.13	1.06	0.01	0.24	7.71	0.52	0.48	0.41	0.38	0.12	0.09
53c	4	9.99	36.37	17.97	17.84	10.24	0.00	3.79	96.21	0.96	2.73	1.27	0.31	1.12	1.14	0.00	0.21	7.74	0.49	0.51	0.40	0.41	0.11	0.08
54c	4	10.00	35.38	18.24	18.00	9.76	0.06	3.94	95.65	0.97	2.68	1.32	0.31	1.14	1.10	0.00	0.22	7.79	0.51	0.49	0.41	0.40	0.11	0.08
55c	4	9.29	35.79	18.23	16.98	10.77	0.03	3.23	94.30	0.90	2.72	1.28	0.35	1.08	1.22	0.00	0.18	7.73	0.47	0.53	0.38	0.43	0.12	0.07
56c	4	9.55	36.15	18.54	18.93	9.94	0.00	3.32	96.43	0.91	2.71	1.29	0.35	1.19	1.11	0.00	0.19	7.74	0.52	0.48	0.42	0.39	0.12	0.07
57c	4	9.80	35.73	17.80	18.29	9.52	0.13	4.52	95.65	0.95	2.70	1.30	0.29	1.16	1.07	0.01	0.26	7.72	0.52	0.48	0.42	0.39	0.10	0.09
58c	4	9.88	36.09	18.23	18.20	9.72	0.00	4.29	96.42	0.94	2.70	1.30	0.31	1.14	1.09	0.00	0.24	7.72	0.51	0.49	0.41	0.39	0.11	0.09
60r	1	9.37	36.34	18.63	14.67	11.38	0.00	4.26	94.83	0.89	2.71	1.29	0.35	0.92	1.27	0.00	0.24	7.68	0.42	0.58	0.33	0.46	0.13	0.09

60c	1	9.75	37.32	18.96	15.42	12.29	0.00	4.24	98.38	0.90	2.69	1.31	0.31	0.93	1.32	0.00	0.23	7.75	0.41	0.59	0.33	0.47	0.11	0.08
61r	1	8.26	36.50	19.10	14.12	11.90	0.00	3.94	94.09	0.78	2.72	1.28	0.39	0.88	1.32	0.00	0.22	7.62	0.40	0.60	0.31	0.47	0.14	0.08
61c	1	9.50	37.15	19.18	15.10	12.01	0.05	4.25	97.19	0.88	2.70	1.30	0.35	0.92	1.30	0.00	0.23	7.68	0.41	0.59	0.33	0.46	0.12	0.08
62c	1	9.47	37.43	19.76	16.20	12.16	0.09	2.62	97.63	0.88	2.72	1.28	0.41	0.98	1.32	0.01	0.14	7.73	0.43	0.57	0.34	0.46	0.14	0.05
63c	3	9.86	35.78	17.81	18.19	9.46	0.05	4.17	95.27	0.95	2.72	1.28	0.31	1.15	1.07	0.00	0.24	7.73	0.52	0.48	0.42	0.39	0.11	0.09
64c	4	9.71	35.51	17.89	18.76	9.16	0.00	4.43	95.46	0.94	2.70	1.30	0.30	1.19	1.04	0.00	0.25	7.72	0.53	0.47	0.43	0.37	0.11	0.09
65c	4	9.62	36.19	18.76	17.87	10.13	0.09	3.14	95.70	0.92	2.72	1.28	0.38	1.12	1.13	0.01	0.18	7.74	0.50	0.50	0.40	0.40	0.13	0.06
66c	4	9.83	36.10	17.91	18.52	9.45	0.00	4.98	96.79	0.94	2.70	1.30	0.28	1.16	1.05	0.00	0.28	7.70	0.52	0.48	0.42	0.38	0.10	0.10
67c	4	9.84	35.18	16.76	18.56	9.37	0.14	5.15	94.86	0.96	2.70	1.30	0.21	1.19	1.07	0.01	0.30	7.73	0.53	0.47	0.43	0.39	0.08	0.11
68c	4	9.71	35.39	17.60	18.66	9.36	0.00	4.28	95.01	0.95	2.70	1.30	0.29	1.19	1.07	0.00	0.25	7.73	0.53	0.47	0.43	0.38	0.10	0.09
69c	4	9.77	34.90	17.31	18.48	9.17	0.02	4.68	94.30	0.96	2.69	1.31	0.26	1.19	1.05	0.00	0.27	7.73	0.53	0.47	0.43	0.38	0.09	0.10
70c	4	9.80	35.44	17.63	17.98	9.89	0.00	4.17	94.91	0.95	2.70	1.30	0.28	1.15	1.12	0.00	0.24	7.75	0.50	0.50	0.41	0.40	0.10	0.09

APPENDIX 5: PLAGIOCLASE ANALYSES

Table 5.1: Plagioclase analyses from sample 100. Traverses were done across plagioclase adjacent to garnet (T3) and plagioclase isolated from garnet in the matrix (T4) with distance being the distance from point A in microns on the traverse. Spot analyses were done on grains included in garnet (T1) with 'r' indicating a rim analysis and 'c' representing a core analysis.

Grain # and Type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 1 T3	1	0	7.72	6.90	0.22	25.10	59.43	99.38	0.67	0.33	0.01	1.33	2.67	5.01	0.66	0.33	0.01
	2	50	7.49	7.00	0.25	25.35	59.04	99.14	0.65	0.34	0.01	1.34	2.66	5.01	0.65	0.34	0.01
	4	150	7.35	7.60	0.27	25.79	58.29	99.31	0.64	0.37	0.02	1.37	2.63	5.02	0.63	0.36	0.02
	5	200	6.91	7.70	0.19	25.54	57.70	98.04	0.61	0.38	0.01	1.37	2.63	5.00	0.61	0.38	0.01
	6	250	7.17	7.88	0.19	26.17	57.89	99.31	0.63	0.38	0.01	1.39	2.61	5.02	0.62	0.37	0.01
	7	300	7.15	7.59	0.28	26.24	59.22	100.48	0.62	0.36	0.02	1.37	2.63	5.00	0.62	0.36	0.02
	8	350	6.91	7.64	0.19	25.00	58.43	98.18	0.61	0.37	0.01	1.34	2.65	4.99	0.61	0.37	0.01
	9	400	7.33	7.19	0.25	25.48	58.27	98.53	0.64	0.35	0.01	1.36	2.64	5.01	0.64	0.35	0.01
	10	450	7.34	7.30	0.21	25.44	58.87	99.16	0.64	0.35	0.01	1.35	2.65	5.00	0.64	0.35	0.01
Grain 2 T4	1	0	7.80	6.78	0.18	25.10	58.93	98.79	0.68	0.33	0.01	1.34	2.66	5.02	0.67	0.32	0.01
	2	50	7.76	6.75	0.09	25.00	58.69	98.20	0.68	0.33	0.01	1.34	2.66	5.01	0.67	0.32	0.01
	5	200	7.73	6.66	0.20	25.35	59.77	99.71	0.67	0.32	0.01	1.33	2.67	5.00	0.67	0.32	0.01
	6	250	7.53	6.80	0.11	24.78	58.72	97.83	0.66	0.33	0.01	1.33	2.67	5.00	0.66	0.33	0.01
	7	300	7.51	6.53	0.10	24.89	59.15	98.08	0.66	0.32	0.01	1.33	2.68	4.99	0.67	0.32	0.01
	8	350	7.67	6.52	0.24	25.03	59.89	99.35	0.67	0.31	0.01	1.32	2.68	5.00	0.67	0.32	0.01
	9	400	7.50	6.79	0.18	25.07	59.24	98.78	0.66	0.33	0.01	1.33	2.67	5.00	0.66	0.33	0.01
	10	450	7.86	6.55	0.16	25.33	59.91	99.82	0.68	0.31	0.01	1.33	2.67	5.01	0.68	0.31	0.01
Grain 3 T4	1	0	7.47	7.00	0.16	24.73	59.09	98.46	0.66	0.34	0.01	1.32	2.67	5.00	0.65	0.34	0.01
	2	50	7.36	6.53	0.22	25.34	58.99	98.44	0.64	0.32	0.01	1.35	2.67	4.99	0.66	0.32	0.01
	3	100	7.51	6.37	0.16	24.79	59.36	98.20	0.66	0.31	0.01	1.32	2.69	4.99	0.67	0.32	0.01
	4	150	7.32	6.62	0.39	24.79	59.35	98.48	0.64	0.32	0.02	1.32	2.68	4.99	0.65	0.33	0.02
	5	200	7.52	6.63	0.17	25.15	59.30	98.78	0.66	0.32	0.01	1.34	2.67	4.99	0.67	0.32	0.01
	6	250	7.55	6.65	0.43	25.14	59.34	99.11	0.66	0.32	0.02	1.33	2.67	5.01	0.66	0.32	0.02
	7	300	7.90	6.72	0.33	25.10	59.73	99.78	0.68	0.32	0.02	1.32	2.67	5.02	0.67	0.31	0.02
	8	350	7.70	6.57	0.23	24.64	59.62	98.76	0.67	0.32	0.01	1.31	2.69	5.00	0.67	0.32	0.01
	9	400	7.64	6.58	0.26	24.69	59.05	98.21	0.67	0.32	0.02	1.32	2.68	5.01	0.67	0.32	0.01

Grain 4 T4	1	0	7.75	7.16	0.14	25.44	58.62	98.96	0.68	0.35	0.01	1.35	2.64	5.02	0.66	0.34	0.01
	2	50	7.66	7.56	0.14	25.45	58.80	99.46	0.67	0.36	0.01	1.35	2.64	5.02	0.64	0.35	0.01
	3	100	7.32	7.23	0.15	25.29	57.90	97.88	0.65	0.35	0.01	1.36	2.64	5.01	0.64	0.35	0.01
	4	150	7.03	7.07	0.23	25.00	58.70	98.03	0.62	0.34	0.01	1.34	2.67	4.98	0.63	0.35	0.01
	5	200	7.39	7.19	0.15	25.46	58.90	99.08	0.64	0.35	0.01	1.35	2.65	5.00	0.64	0.35	0.01
	6	250	7.37	7.23	0.18	25.35	59.03	99.15	0.64	0.35	0.01	1.34	2.65	5.00	0.64	0.35	0.01
	7	300	7.34	7.04	0.18	24.73	58.62	97.90	0.65	0.34	0.01	1.33	2.67	5.00	0.65	0.34	0.01
	8	350	7.53	6.75	0.21	24.85	58.92	98.26	0.66	0.33	0.01	1.33	2.67	5.00	0.66	0.33	0.01
Grain 5 T4	3	100	7.86	6.83	0.22	25.23	58.99	99.13	0.69	0.33	0.01	1.34	2.66	5.02	0.67	0.32	0.01
	4	150	7.75	6.30	0.24	24.74	60.29	99.31	0.67	0.30	0.01	1.31	2.70	4.99	0.68	0.31	0.01
	5	200	7.53	6.45	0.32	24.74	59.39	98.43	0.66	0.31	0.02	1.32	2.69	5.00	0.67	0.32	0.02
	6	250	7.75	6.41	0.25	24.98	58.78	98.17	0.68	0.31	0.01	1.34	2.67	5.01	0.68	0.31	0.01
	7	300	7.78	6.46	0.35	25.05	60.07	99.72	0.67	0.31	0.02	1.32	2.68	5.00	0.67	0.31	0.02
	9	400	7.66	6.53	0.25	24.69	59.51	98.64	0.67	0.32	0.01	1.31	2.69	5.00	0.67	0.32	0.01
	10	450	7.91	6.82	0.10	25.40	58.79	98.91	0.69	0.33	0.01	1.35	2.65	5.02	0.67	0.32	0.01
Grain 6 T1	0c		7.74	7.29	0.00	24.79	58.71	98.53	0.68	0.35	0.00	1.32	2.66	5.02	0.66	0.34	0.00
	1r		7.47	7.58	0.21	25.32	59.50	100.08	0.65	0.36	0.12	1.33	2.66	5.01	0.57	0.32	0.11
	2c		7.83	7.54	0.22	25.93	58.45	99.97	0.68	0.36	0.12	1.37	2.62	5.04	0.59	0.31	0.10
	3r		7.75	7.45	0.23	25.51	58.80	99.73	0.67	0.36	0.01	1.35	2.64	5.03	0.64	0.34	0.01
	4r		7.75	7.53	0.23	24.90	57.33	97.74	0.69	0.37	0.01	1.35	2.63	5.05	0.64	0.34	0.01
	5c		7.45	7.59	0.29	25.52	59.18	100.04	0.65	0.36	0.02	1.34	2.64	5.02	0.63	0.35	0.02
	6r		7.95	7.52	0.20	25.88	59.32	100.87	0.68	0.36	0.01	1.35	2.63	5.04	0.65	0.34	0.01
	7c		7.67	7.54	0.21	25.51	58.21	99.14	0.67	0.37	0.01	1.36	2.69	5.03	0.64	0.35	0.01
	8r		7.15	7.80	0.20	26.05	58.72	100.88	0.62	0.37	0.01	1.37	2.61	5.01	0.62	0.37	0.01
Grain 7 T1	9c		7.49	7.67	0.00	25.55	58.82	99.53	0.65	0.37	0.00	1.35	2.64	5.01	0.64	0.36	0.00
	10r		7.41	7.81	0.27	25.69	58.44	100.07	0.64	0.38	0.02	1.36	2.62	5.03	0.62	0.36	0.01
Grain 8 T1	11c		6.93	8.15	0.27	25.77	57.07	98.19	0.61	0.40	0.02	1.39	2.60	5.02	0.60	0.39	0.01
	12r		7.15	8.31	0.24	26.14	57.28	99.52	0.63	0.40	0.01	1.39	2.59	5.04	0.60	0.39	0.01
Grain 9 T1	13r		7.36	7.49	0.17	25.64	59.29	99.95	0.64	0.36	0.01	1.35	2.65	5.00	0.63	0.36	0.01
	14c		7.43	7.59	0.24	25.14	57.91	98.31	0.66	0.37	0.01	1.35	2.64	5.02	0.63	0.36	0.01
Grain 10 T1	15c		7.68	7.32	0.16	25.36	58.82	99.33	0.67	0.35	0.01	1.35	2.65	5.02	0.65	0.34	0.01
	16r		8.30	7.10	0.00	25.67	60.44	101.51	0.71	0.33	0.00	1.33	2.66	5.03	0.68	0.32	0.00

Table 5.2: Plagioclase analyses from specimen 11E1. Traverses were done across plagioclase touching garnet (T2), plagioclase adjacent to garnet (T3) and plagioclase isolated from garnet in the matrix (T4) with distance being the distance from point A in microns on the traverse. Spot analyses were done on a grain included in garnet (T1) with 'r' indicating a rim analysis and 'c' representing a core analysis.

Grain # and Type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 1 T4	1	0	10.43	1.59	0.00	20.32	64.31	96.66	0.92	0.08	0.00	1.09	2.92	5.00	0.92	0.08	0.00
	2	38	10.59	1.62	0.07	20.49	64.73	97.43	0.92	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	4	113	10.39	1.59	0.10	20.31	64.62	97.02	0.91	0.08	0.01	1.08	2.92	5.00	0.92	0.08	0.01
	6	189	10.75	1.56	0.00	20.45	64.13	96.89	0.94	0.08	0.00	1.09	2.91	5.02	0.93	0.07	0.00
	7	227	10.41	1.83	0.08	20.40	65.27	97.91	0.90	0.09	0.00	1.08	2.92	4.99	0.91	0.09	0.00
	8	264	10.73	1.79	0.00	20.86	65.05	98.43	0.93	0.09	0.00	1.10	2.90	5.01	0.92	0.08	0.00
	9	302	10.52	1.50	0.00	20.38	63.87	96.28	0.93	0.07	0.00	1.09	2.91	5.01	0.93	0.07	0.00
	10	340	10.35	1.69	0.00	20.60	63.56	96.20	0.92	0.08	0.00	1.11	2.90	5.00	0.92	0.08	0.00
Grain 2 T4	2	35	10.75	1.67	0.05	20.64	64.40	97.46	0.94	0.08	0.00	1.10	2.90	5.02	0.92	0.08	0.00
	3	70	10.52	1.69	0.00	21.09	64.24	97.54	0.92	0.08	0.00	1.12	2.89	5.01	0.92	0.08	0.00
	4	105	10.27	1.78	0.00	20.96	64.42	97.43	0.90	0.09	0.00	1.11	2.90	4.99	0.92	0.09	0.00
	5	140	10.25	1.67	0.17	20.41	64.42	96.92	0.90	0.08	0.01	1.09	2.92	4.99	0.91	0.08	0.01
	6	175	10.13	1.67	0.08	20.66	63.97	96.43	0.89	0.08	0.00	1.11	2.91	4.99	0.91	0.08	0.00
	7	210	10.25	1.49	0.22	20.88	64.48	97.32	0.90	0.07	0.01	1.11	2.91	4.99	0.91	0.07	0.01
	9	280	10.28	1.53	0.14	20.73	64.71	97.39	0.90	0.07	0.01	1.10	2.91	4.99	0.92	0.08	0.01
	11	349	10.41	1.76	0.08	20.81	64.02	97.00	0.91	0.09	0.00	1.11	2.90	5.00	0.91	0.08	0.00
	14	454	10.56	1.52	0.01	20.53	64.83	97.44	0.92	0.07	0.00	1.09	2.92	5.00	0.93	0.07	0.00
	16	524	10.63	1.48	0.07	20.40	64.23	96.74	0.94	0.07	0.00	1.09	2.91	5.01	0.93	0.07	0.00
	18	594	10.79	1.52	0.07	20.56	64.50	97.56	0.94	0.07	0.00	1.09	2.91	5.02	0.92	0.07	0.00
Grain 3 T4	1	0	10.57	1.92	0.14	20.91	64.81	98.62	0.92	0.09	0.01	1.10	2.89	5.02	0.90	0.09	0.01
	2	26	10.67	1.69	0.11	20.55	64.31	97.34	0.93	0.08	0.01	1.09	2.90	5.02	0.91	0.08	0.01
	3	53	10.32	1.66	0.06	20.55	64.09	96.82	0.91	0.08	0.00	1.10	2.90	4.99	0.92	0.08	0.00
	4	79	10.18	1.58	0.14	20.22	64.61	96.73	0.89	0.08	0.01	1.08	2.93	4.98	0.91	0.08	0.01
	5	106	10.68	1.54	0.09	20.93	64.03	97.17	0.94	0.07	0.01	1.11	2.89	5.02	0.92	0.07	0.01
	7	159	10.71	1.46	0.12	20.69	64.47	97.45	0.94	0.07	0.01	1.10	2.91	5.02	0.92	0.07	0.01

	10	238	10.60	1.63	0.07	20.71	65.01	97.94	0.92	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	11	265	10.64	1.66	0.00	20.61	64.62	97.53	0.93	0.08	0.00	1.09	2.91	5.01	0.92	0.08	0.00
	12	291	10.69	1.51	0.08	20.81	64.87	97.87	0.93	0.07	0.00	1.10	2.91	5.01	0.92	0.07	0.00
	13	318	10.81	1.48	0.10	20.71	65.22	98.32	0.94	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	14	344	10.62	1.68	0.07	20.44	64.47	97.22	0.93	0.08	0.00	1.09	2.91	5.01	0.92	0.08	0.00
	16	397	10.26	1.65	0.03	20.57	64.33	96.80	0.90	0.08	0.00	1.10	2.91	4.99	0.92	0.08	0.00
	17	424	10.39	1.63	0.07	20.13	63.58	95.74	0.92	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	18	450	10.29	1.51	0.00	20.13	63.82	95.75	0.91	0.07	0.00	1.09	2.92	4.99	0.93	0.08	0.00
Grain 4 T3	2	35	10.33	1.67	0.09	20.67	64.52	97.18	0.90	0.08	0.01	1.10	2.91	4.99	0.91	0.08	0.01
	3	69	10.48	1.68	0.05	20.64	64.72	97.52	0.91	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	4	104	10.80	1.36	0.10	20.33	64.50	97.09	0.95	0.07	0.01	1.08	2.92	5.02	0.93	0.06	0.01
	5	139	10.44	1.51	0.14	20.22	64.49	96.81	0.92	0.07	0.01	1.08	2.92	5.00	0.92	0.07	0.01
	6	174	10.64	1.70	0.07	20.54	65.61	98.50	0.92	0.08	0.00	1.08	2.92	5.00	0.92	0.08	0.00
	7	208	10.60	1.56	0.00	20.59	63.84	96.60	0.93	0.08	0.00	1.10	2.90	5.01	0.93	0.08	0.00
	8	243	10.54	1.47	0.24	20.66	64.31	97.48	0.92	0.07	0.01	1.10	2.90	5.01	0.92	0.07	0.01
	9	278	10.68	1.55	0.16	20.60	64.84	98.07	0.93	0.07	0.01	1.09	2.91	5.02	0.92	0.07	0.01
	10	313	10.82	1.54	0.09	20.37	64.68	97.40	0.95	0.07	0.01	1.08	2.91	5.02	0.92	0.07	0.01
	11	347	10.76	1.47	0.11	20.38	64.55	97.26	0.94	0.07	0.01	1.08	2.91	5.02	0.92	0.07	0.01
	13	417	10.51	1.51	0.00	20.19	64.62	96.83	0.92	0.07	0.00	1.08	2.92	5.00	0.93	0.07	0.00
	14	452	10.76	1.66	0.10	20.66	64.93	98.11	0.93	0.08	0.01	1.09	2.91	5.02	0.92	0.08	0.01
	16	521	10.41	1.54	0.07	20.61	64.42	96.98	0.91	0.07	0.00	1.10	2.91	5.00	0.92	0.08	0.00
	17	556	10.39	1.58	0.00	20.37	65.10	97.44	0.91	0.08	0.00	1.08	2.93	4.99	0.92	0.08	0.00
	18	591	10.64	1.64	0.03	20.60	63.80	96.67	0.94	0.08	0.00	1.10	2.90	5.02	0.92	0.08	0.00
	20	660	10.36	1.61	0.00	20.62	64.14	96.75	0.91	0.08	0.00	1.10	2.91	5.00	0.92	0.08	0.00
Grain 5 T2	1	0	10.20	1.60	0.00	20.25	64.18	96.24	0.90	0.08	0.00	1.09	2.92	4.99	0.92	0.08	0.00
	2	32	10.66	1.68	0.00	20.70	64.52	97.57	0.93	0.08	0.00	1.10	2.90	5.01	0.92	0.08	0.00
	3	64	10.35	1.60	0.00	20.67	64.12	96.94	0.91	0.08	0.00	1.10	2.90	5.00	0.93	0.08	0.00
	8	223	10.83	1.68	0.00	20.54	64.44	97.49	0.95	0.08	0.00	1.09	2.90	5.02	0.93	0.08	0.00
	9	254	10.59	1.70	0.10	20.89	64.60	97.87	0.92	0.08	0.01	1.10	2.90	5.01	0.91	0.08	0.01
	10	286	10.64	1.52	0.10	20.41	64.73	97.39	0.93	0.07	0.01	1.08	2.92	5.01	0.92	0.07	0.01
	11	318	10.37	1.56	0.03	20.74	64.87	97.54	0.90	0.08	0.00	1.10	2.91	4.99	0.92	0.08	0.00
	12	350	10.37	1.44	0.00	20.55	64.69	97.05	0.91	0.07	0.00	1.09	2.92	4.99	0.93	0.07	0.00

	13	381	10.53	1.71	0.08	21.09	64.78	98.10	0.91	0.08	0.00	1.11	2.90	5.00	0.91	0.08	0.00
	14	413	10.81	1.43	0.04	20.57	64.46	97.27	0.95	0.07	0.00	1.09	2.91	5.02	0.93	0.07	0.00
	15	445	10.73	1.55	0.16	20.64	64.25	97.34	0.94	0.08	0.01	1.10	2.90	5.02	0.92	0.07	0.01
	16	477	10.48	1.59	0.06	20.22	64.64	96.93	0.92	0.08	0.00	1.08	2.92	5.00	0.92	0.08	0.00
	18	540	10.43	1.49	0.09	20.49	64.72	97.13	0.91	0.07	0.01	1.09	2.92	4.99	0.92	0.07	0.01
	20	604	10.59	1.53	0.03	20.47	63.92	97.08	0.93	0.07	0.00	1.09	2.90	5.02	0.92	0.07	0.00
	21	636	10.55	1.37	0.15	20.51	63.72	96.61	0.93	0.07	0.01	1.10	2.90	5.02	0.92	0.07	0.01
	22	668	10.73	1.47	0.14	20.56	64.79	97.90	0.93	0.07	0.01	1.09	2.91	5.02	0.92	0.07	0.01
	23	699	10.66	1.41	0.07	20.74	64.90	97.70	0.93	0.07	0.00	1.10	2.91	5.00	0.93	0.07	0.00
	24	731	10.64	1.47	0.04	20.60	64.84	97.55	0.93	0.07	0.00	1.09	2.91	5.00	0.93	0.07	0.00
	25	763	10.42	1.57	0.11	20.35	64.06	96.52	0.92	0.08	0.01	1.09	2.91	5.00	0.92	0.08	0.01
	26	795	10.47	1.57	0.06	20.81	64.79	97.63	0.91	0.08	0.00	1.10	2.91	5.00	0.92	0.08	0.00
	27	827	10.49	1.47	0.17	20.77	64.69	97.58	0.91	0.07	0.01	1.10	2.91	5.00	0.92	0.07	0.01
	29	890	10.44	1.33	0.10	20.51	64.65	97.04	0.91	0.06	0.01	1.09	2.92	4.99	0.93	0.07	0.01
	30	922	10.40	1.68	0.22	19.90	63.99	96.18	0.92	0.08	0.01	1.07	2.92	5.01	0.91	0.08	0.01
	31	954	10.59	1.53	0.02	20.45	64.50	97.06	0.93	0.07	0.00	1.09	2.91	5.00	0.93	0.07	0.00
	32	985	10.54	1.53	0.00	20.54	64.69	97.31	0.92	0.07	-0.00	1.09	2.91	5.00	0.93	0.07	0.00
	33	1017	10.72	1.38	0.17	20.63	65.22	98.12	0.93	0.07	0.01	1.09	2.92	5.01	0.92	0.07	0.01
	34	1049	10.87	1.47	0.15	21.50	65.58	99.85	0.93	0.07	0.01	1.12	2.89	5.02	0.92	0.07	0.01
	35	1081	10.17	1.46	0.13	19.90	63.50	95.16	0.91	0.07	0.01	1.08	2.92	4.99	0.92	0.07	0.01
	37	1144	10.26	1.46	0.13	20.43	64.50	96.78	0.90	0.07	0.01	1.09	2.92	4.99	0.92	0.07	0.01
	38	1176	10.53	1.52	0.03	20.60	65.07	97.72	0.92	0.07	0.00	1.09	2.92	5.00	0.92	0.07	0.00
	39	1208	10.71	1.57	0.15	20.76	65.04	98.22	0.93	0.08	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	40	1240	10.48	1.45	0.10	20.37	64.48	96.88	0.92	0.07	0.01	1.09	2.92	5.00	0.92	0.07	0.01
Grain 6 T2	1	0	10.52	1.67	0.06	20.86	64.37	97.43	0.92	0.08	0.00	1.11	2.90	5.01	0.92	0.08	0.00
	2	28	10.88	1.62	0.00	20.74	65.16	98.39	0.94	0.08	0.00	1.09	2.91	5.02	0.92	0.08	0.00
	5	112	10.79	1.61	0.01	20.50	64.52	97.42	0.94	0.08	0.00	1.09	2.91	5.02	0.92	0.08	0.00
	6	140	10.38	1.52	0.13	21.01	64.73	97.77	0.90	0.07	0.01	1.11	2.90	5.00	0.92	0.07	0.01
	7	168	10.61	1.53	0.00	20.05	64.09	96.28	0.94	0.07	0.00	1.08	2.92	5.01	0.93	0.07	0.00
	10	252	10.49	1.65	0.13	20.65	64.11	97.04	0.92	0.08	0.01	1.10	2.90	5.01	0.91	0.08	0.01
	12	308	10.52	1.40	0.16	20.39	65.22	97.70	0.92	0.07	0.01	1.08	2.93	5.00	0.92	0.07	0.01
	13	336	10.37	1.67	0.13	20.56	64.69	97.43	0.91	0.08	0.01	1.09	2.91	5.00	0.91	0.08	0.01

	14	364	10.62	1.54	0.03	20.45	64.84	97.45	0.93	0.07	0.00	1.08	2.92	5.00	0.92	0.07	0.00
	15	392	10.35	1.56	0.25	20.60	64.59	97.35	0.90	0.08	0.01	1.09	2.91	5.00	0.91	0.08	0.01
	16	420	9.17	1.33	0.04	18.20	57.25	85.97	0.91	0.07	0.00	1.09	2.92	4.99	0.92	0.07	0.00
	17	448	10.42	1.39	0.10	20.83	64.58	97.32	0.91	0.07	0.01	1.11	2.91	5.00	0.93	0.07	0.01
	18	476	10.41	1.62	0.16	20.61	64.59	97.39	0.91	0.08	0.01	1.09	2.91	5.00	0.91	0.08	0.01
	19	504	10.48	1.45	0.06	20.17	64.63	96.72	0.92	0.07	0.00	1.08	2.93	4.99	0.93	0.07	0.00
Grain 7 T3	1	0	10.68	1.51	0.16	20.93	64.79	98.33	0.93	0.07	0.01	1.10	2.90	5.02	0.92	0.07	0.01
	2	36	10.48	1.60	0.05	20.63	64.26	96.97	0.92	0.08	0.00	1.10	2.91	5.00	0.92	0.08	0.00
	4	108	10.61	1.44	0.10	20.84	64.50	97.48	0.93	0.07	0.01	1.11	2.90	5.01	0.92	0.07	0.01
	5	144	10.49	1.51	0.09	20.29	64.69	96.98	0.92	0.07	0.01	1.08	2.92	5.00	0.92	0.07	0.01
	8	251	10.25	1.57	0.15	20.55	64.22	96.75	0.90	0.08	0.01	1.10	2.91	5.00	0.91	0.08	0.01
	9	287	10.47	1.47	0.03	20.71	64.35	97.01	0.92	0.07	0.00	1.10	2.91	5.00	0.93	0.07	0.00
	10	323	10.43	1.65	0.07	20.66	64.82	97.57	0.91	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	12	395	10.68	1.51	0.12	20.97	64.79	98.08	0.93	0.07	0.01	1.11	2.90	5.01	0.92	0.07	0.01
	13	431	10.59	1.54	0.11	21.03	64.85	98.12	0.92	0.07	0.01	1.11	2.90	5.01	0.92	0.07	0.01
	14	467	10.75	1.41	0.11	20.63	65.25	98.14	0.93	0.07	0.01	1.09	2.92	5.01	0.93	0.07	0.01
	17	574	10.43	1.47	0.04	20.44	64.74	97.08	0.91	0.07	0.00	1.09	2.92	4.99	0.93	0.07	0.00
	18	610	10.61	1.64	0.00	20.43	64.11	96.79	0.93	0.08	0.00	1.09	2.91	5.01	0.92	0.08	0.00
	19	646	10.31	1.60	0.00	20.48	64.67	97.05	0.90	0.08	0.00	1.09	2.92	4.99	0.92	0.08	0.00
Grain 8 T3	1	0	10.79	1.47	0.00	20.67	64.32	97.25	0.94	0.07	0.00	1.10	2.90	5.02	0.93	0.07	0.00
	6	165	10.68	1.58	0.14	20.82	65.09	98.31	0.93	0.08	0.01	1.10	2.91	5.01	0.92	0.07	0.01
	7	198	10.41	1.44	0.13	20.61	65.09	97.67	0.91	0.07	0.01	1.09	2.92	4.99	0.92	0.07	0.01
	8	231	10.51	1.61	0.06	20.83	65.33	98.27	0.91	0.08	0.00	1.09	2.91	4.99	0.92	0.08	0.00
	9	264	10.55	1.54	0.11	20.81	65.19	98.40	0.91	0.07	0.01	1.09	2.91	5.00	0.92	0.07	0.01
	12	363	10.74	1.56	0.06	20.95	64.83	98.35	0.93	0.07	0.00	1.10	2.89	5.02	0.92	0.07	0.00
	13	396	10.69	1.59	0.17	20.47	64.27	97.18	0.94	0.08	0.01	1.09	2.91	5.02	0.92	0.08	0.01
	14	429	10.42	1.59	0.00	20.45	64.41	97.06	0.91	0.08	0.00	1.09	2.91	5.00	0.92	0.08	0.00
	15	462	10.62	1.52	0.13	20.40	64.81	97.47	0.93	0.07	0.01	1.08	2.92	5.01	0.92	0.07	0.01
	16	495	10.40	1.56	0.08	20.67	64.39	97.02	0.91	0.08	0.00	1.10	2.91	5.00	0.92	0.08	0.00
	17	528	10.61	1.42	0.13	20.24	64.63	97.03	0.93	0.07	0.01	1.08	2.92	5.01	0.92	0.07	0.01
	18	560	10.40	1.54	0.16	20.66	64.21	96.97	0.91	0.07	0.01	1.10	2.91	5.00	0.92	0.07	0.01
	19	593	10.63	1.53	0.03	20.59	64.21	96.95	0.93	0.07	0.00	1.10	2.91	5.01	0.92	0.07	0.00

	20	626	10.41	1.61	0.09	20.49	64.72	97.24	0.91	0.08	0.01	1.09	2.92	4.99	0.92	0.08	0.01
	21	659	10.54	1.51	0.19	20.55	64.56	97.35	0.92	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	22	692	10.55	1.64	0.08	20.46	64.16	96.81	0.93	0.08	0.00	1.09	2.91	5.01	0.92	0.08	0.00
	23	725	10.26	1.46	0.06	20.39	64.32	96.43	0.90	0.07	0.00	1.09	2.92	4.99	0.92	0.07	0.00
	25	791	10.41	1.68	0.03	20.02	63.73	95.85	0.92	0.08	0.00	1.08	2.92	5.00	0.92	0.08	0.00
	26	824	10.58	1.42	0.06	20.47	63.97	96.44	0.93	0.07	0.00	1.10	2.91	5.01	0.93	0.07	0.00
	28	890	10.53	1.57	0.13	20.38	64.84	97.44	0.92	0.08	0.01	1.08	2.92	5.00	0.92	0.08	0.01
	29	923	10.65	1.53	0.12	20.66	64.76	97.72	0.93	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	30	956	10.65	1.43	0.06	20.91	64.98	97.97	0.92	0.07	0.00	1.10	2.91	5.00	0.93	0.07	0.00
	32	1022	10.61	1.60	0.00	21.01	65.06	98.28	0.92	0.08	0.00	1.11	2.90	5.00	0.92	0.08	0.00
	33	1055	10.84	1.49	0.08	20.55	64.95	97.82	0.94	0.07	0.00	1.09	2.91	5.01	0.93	0.07	0.00
	34	1088	10.80	1.69	0.14	20.87	65.24	98.74	0.93	0.08	0.01	1.09	2.90	5.02	0.91	0.08	0.01
Grain 9 T4	1	0	10.52	1.61	0.10	20.64	64.49	97.37	0.92	0.08	0.01	1.10	2.91	5.01	0.92	0.08	0.01
	2	39	10.63	1.40	0.12	20.22	64.32	96.69	0.94	0.07	0.01	1.08	2.92	5.01	0.93	0.07	0.01
	4	117	10.60	1.56	0.07	19.97	64.24	96.37	0.94	0.08	0.00	1.07	2.92	5.01	0.92	0.08	0.00
	5	156	10.42	1.25	0.07	20.20	64.33	96.19	0.92	0.06	0.00	1.08	2.93	4.99	0.93	0.06	0.00
	6	195	10.20	1.44	0.10	19.90	63.97	95.61	0.91	0.07	0.01	1.07	2.93	4.99	0.92	0.07	0.01
	7	234	10.26	1.45	0.14	20.23	64.44	96.52	0.90	0.07	0.01	1.08	2.93	4.99	0.92	0.07	0.01
	8	273	10.77	1.37	0.17	20.30	65.12	97.96	0.94	0.07	0.01	1.07	2.92	5.02	0.93	0.06	0.01
	9	312	10.69	1.27	0.08	20.62	65.62	98.21	0.92	0.06	0.00	1.08	2.93	4.99	0.93	0.06	0.00
	10	351	10.52	1.34	0.19	20.92	66.16	99.12	0.90	0.06	0.01	1.09	2.92	4.99	0.92	0.07	0.01
	11	390	10.48	1.26	0.03	20.33	64.78	96.85	0.92	0.06	0.00	1.08	2.93	4.99	0.94	0.06	0.00
	13	468	10.45	1.42	0.17	20.03	64.74	96.80	0.92	0.07	0.01	1.07	2.93	5.00	0.92	0.07	0.01
	15	546	10.89	1.24	0.15	20.57	64.73	97.58	0.95	0.06	0.01	1.09	2.91	5.02	0.93	0.06	0.01
	16	585	10.92	1.09	0.21	20.39	65.51	98.11	0.95	0.05	0.01	1.07	2.93	5.01	0.94	0.05	0.01
	17	624	10.72	1.20	0.22	19.95	64.86	96.94	0.94	0.06	0.01	1.06	2.93	5.01	0.93	0.06	0.01
	18	663	10.52	1.05	0.13	20.16	65.44	97.31	0.92	0.05	0.01	1.07	2.94	4.99	0.94	0.05	0.01
	19	702	11.07	1.19	0.14	20.40	65.61	98.41	0.96	0.06	0.01	1.07	2.93	5.02	0.94	0.06	0.01
	21	780	10.68	1.15	0.15	20.19	65.69	97.84	0.93	0.06	0.01	1.06	2.94	4.99	0.94	0.06	0.01
	22	819	10.63	1.08	0.13	20.27	65.19	97.29	0.93	0.05	0.01	1.08	2.93	5.00	0.94	0.05	0.01
	23	858	10.43	1.19	0.11	20.13	63.91	95.75	0.92	0.06	0.01	1.09	2.92	5.00	0.93	0.06	0.01
	24	897	10.79	1.17	0.12	20.44	65.39	97.90	0.94	0.06	0.01	1.08	2.93	5.01	0.94	0.06	0.01

	25	936	10.69	1.22	0.13	20.52	65.62	98.19	0.92	0.06	0.01	1.08	2.93	5.00	0.93	0.06	0.01
	27	1014	10.64	1.41	0.12	20.56	64.94	97.68	0.93	0.07	0.01	1.09	2.92	5.01	0.93	0.07	0.01
	28	1053	10.61	1.23	0.19	20.45	64.74	97.21	0.93	0.06	0.01	1.09	2.92	5.01	0.93	0.06	0.01
	29	1092	10.41	1.30	0.16	20.61	65.11	97.58	0.91	0.06	0.01	1.09	2.92	4.99	0.93	0.06	0.01
	30	1131	10.74	1.24	0.14	20.31	65.01	97.43	0.94	0.06	0.01	1.08	2.93	5.01	0.93	0.06	0.01
	32	1209	10.78	1.25	0.23	20.67	65.77	98.69	0.93	0.06	0.01	1.08	2.92	5.01	0.93	0.06	0.01
	35	1326	10.29	1.47	0.20	20.42	64.62	97.00	0.90	0.07	0.01	1.09	2.92	4.99	0.92	0.07	0.01
	36	1365	10.30	1.56	0.16	20.12	64.44	96.59	0.91	0.08	0.01	1.08	2.93	4.99	0.91	0.08	0.01
	38	1443	10.61	1.64	0.19	20.75	64.92	98.10	0.92	0.08	0.01	1.09	2.91	5.01	0.91	0.08	0.01
	39	1482	10.40	1.48	0.20	20.75	64.94	97.76	0.90	0.07	0.01	1.10	2.91	5.00	0.92	0.07	0.01
	40	1521	10.49	1.53	0.01	20.76	64.40	97.38	0.92	0.07	0.00	1.10	2.90	5.00	0.92	0.07	0.00
Grain 10 T4	3	55	10.34	1.67	0.11	20.78	64.71	97.86	0.90	0.08	0.01	1.10	2.90	5.00	0.91	0.08	0.01
	4	82	10.39	1.60	0.19	20.41	63.85	96.44	0.92	0.08	0.01	1.10	2.91	5.01	0.91	0.08	0.01
	7	164	10.59	1.66	0.09	20.29	64.65	97.19	0.93	0.08	0.01	1.08	2.92	5.01	0.92	0.08	0.01
	10	246	10.78	1.58	0.13	20.67	64.88	98.03	0.94	0.08	0.01	1.09	2.91	5.02	0.92	0.07	0.01
	11	274	10.79	1.55	0.16	20.38	65.17	98.22	0.94	0.07	0.01	1.07	2.92	5.01	0.92	0.07	0.01
	12	301	10.75	1.47	0.10	20.51	64.38	97.21	0.94	0.07	0.01	1.09	2.91	5.02	0.92	0.07	0.01
	13	328	10.29	1.66	0.17	20.71	64.42	97.26	0.90	0.08	0.01	1.10	2.91	5.00	0.91	0.08	0.01
	15	383	10.73	1.37	0.14	20.51	64.38	97.13	0.94	0.07	0.01	1.09	2.91	5.02	0.93	0.07	0.01
	16	411	10.66	1.66	0.06	20.20	64.59	97.11	0.93	0.08	0.00	1.08	2.92	5.01	0.92	0.08	0.00
	17	438	10.62	1.67	0.10	20.54	64.58	97.71	0.93	0.08	0.01	1.09	2.91	5.02	0.91	0.08	0.01
	18	465	10.16	1.45	0.17	20.18	63.81	95.76	0.90	0.07	0.01	1.09	2.92	4.99	0.92	0.07	0.01
	19	493	10.43	1.52	0.00	20.63	64.52	97.10	0.91	0.07	0.00	1.10	2.91	5.00	0.93	0.07	0.00
	20	520	10.79	1.59	0.03	20.89	64.96	98.22	0.93	0.08	0.00	1.10	2.90	5.01	0.92	0.08	0.00
Grain 11 T4	1	0	10.68	1.46	0.06	20.93	64.39	97.46	0.93	0.07	0.00	1.11	2.90	5.01	0.93	0.07	0.00
	3	88	10.45	1.45	0.20	20.72	64.78	97.59	0.91	0.07	0.01	1.10	2.91	5.00	0.92	0.07	0.01
	4	132	10.63	1.36	0.25	20.20	65.20	97.84	0.93	0.07	0.01	1.07	2.93	5.01	0.92	0.06	0.01
	5	176	10.71	1.38	0.21	20.55	64.63	97.49	0.94	0.07	0.01	1.09	2.91	5.02	0.92	0.07	0.01
	6	220	10.68	1.53	0.15	20.77	65.55	98.89	0.92	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	7	264	10.58	1.53	0.18	20.81	65.38	98.48	0.91	0.07	0.01	1.09	2.91	5.00	0.92	0.07	0.01
	8	308	10.42	1.51	0.17	20.79	64.41	97.29	0.91	0.07	0.01	1.11	2.90	5.00	0.92	0.07	0.01
	9	352	10.59	1.47	0.15	20.63	64.86	97.70	0.92	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01

	10	396	10.81	1.42	0.13	20.57	65.07	97.99	0.94	0.07	0.01	1.09	2.91	5.02	0.93	0.07	0.01
	11	440	10.74	1.36	0.13	20.47	64.41	97.11	0.94	0.07	0.01	1.09	2.91	5.02	0.93	0.07	0.01
	14	572	10.14	1.49	0.17	20.05	63.10	94.95	0.91	0.07	0.01	1.09	2.91	5.00	0.92	0.07	0.01
	17	704	10.66	1.66	0.19	20.81	64.57	97.89	0.93	0.08	0.01	1.10	2.90	5.02	0.91	0.08	0.01
	18	748	10.75	1.48	0.06	20.86	65.37	98.46	0.93	0.07	0.00	1.10	2.91	5.01	0.93	0.07	0.00
	19	792	10.60	1.39	0.17	20.33	64.48	96.98	0.93	0.07	0.01	1.08	2.92	5.01	0.92	0.07	0.01
	20	836	10.67	1.69	0.15	20.44	64.39	97.34	0.93	0.08	0.01	1.09	2.91	5.02	0.91	0.08	0.01
	21	880	10.64	1.38	0.05	20.64	65.13	97.78	0.92	0.07	0.00	1.09	2.92	5.00	0.93	0.07	0.00
	29	1231	10.75	1.67	0.10	21.05	64.36	97.93	0.94	0.08	0.01	1.11	2.89	5.02	0.92	0.08	0.01
	30	1275	10.53	1.56	0.09	20.42	64.34	96.85	0.92	0.08	0.01	1.09	2.91	5.00	0.92	0.08	0.01
	31	1319	10.61	1.52	0.13	20.65	65.06	98.17	0.92	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	32	1363	10.60	1.54	0.16	20.69	64.69	97.85	0.92	0.07	0.01	1.09	2.90	5.01	0.92	0.07	0.01
	34	1451	10.42	1.48	0.08	20.27	64.29	96.47	0.92	0.07	0.00	1.09	2.92	5.00	0.92	0.07	0.00
	35	1495	10.37	1.47	0.17	20.06	63.88	95.95	0.92	0.07	0.01	1.08	2.92	5.00	0.92	0.07	0.01
	36	1539	10.32	1.69	0.20	20.44	64.40	97.04	0.91	0.08	0.01	1.09	2.91	5.00	0.91	0.08	0.01
	37	1583	10.33	1.51	0.18	20.79	64.63	97.77	0.90	0.07	0.01	1.10	2.90	5.00	0.92	0.07	0.01
	38	1627	10.33	1.52	0.20	20.57	64.76	97.38	0.90	0.07	0.01	1.09	2.92	4.99	0.91	0.07	0.01
	39	1671	10.70	1.57	0.17	20.84	64.95	98.22	0.93	0.08	0.01	1.10	2.90	5.01	0.92	0.07	0.01
	40	1715	10.29	1.56	0.23	20.61	65.00	97.86	0.89	0.08	0.01	1.09	2.91	4.99	0.91	0.08	0.01
	42	1803	10.23	1.54	0.09	20.64	63.79	96.20	0.90	0.08	0.01	1.11	2.91	4.99	0.92	0.08	0.01
	43	1847	10.66	1.47	0.05	20.48	63.54	96.15	0.94	0.07	0.00	1.10	2.90	5.02	0.93	0.07	0.00
	44	1891	10.70	1.62	0.04	20.63	64.70	97.93	0.93	0.08	0.00	1.09	2.90	5.01	0.92	0.08	0.00
	45	1935	10.23	1.65	0.09	20.42	64.03	96.33	0.90	0.08	0.01	1.09	2.91	4.99	0.91	0.08	0.01
Grain 12 T4	2	31	10.39	1.47	0.09	20.64	65.17	97.67	0.90	0.07	0.01	1.09	2.92	4.98	0.92	0.07	0.01
	4	93	10.45	1.50	0.03	20.57	65.19	97.72	0.91	0.07	0.00	1.09	2.92	4.99	0.92	0.07	0.00
	5	124	10.60	1.44	0.12	20.95	65.19	98.51	0.92	0.07	0.01	1.10	2.90	5.01	0.92	0.07	0.01
	6	155	10.72	1.44	0.15	20.86	64.73	97.89	0.93	0.07	0.01	1.10	2.90	5.02	0.92	0.07	0.01
	7	186	10.43	1.51	0.23	20.78	64.78	97.72	0.91	0.07	0.01	1.10	2.91	5.00	0.91	0.07	0.01
	8	217	10.88	1.41	0.05	20.45	64.67	97.42	0.95	0.07	0.00	1.09	2.91	5.02	0.93	0.07	0.00
	12	341	10.56	1.33	0.11	20.78	65.20	98.17	0.91	0.06	0.01	1.09	2.91	5.00	0.93	0.06	0.01
	18	528	10.77	1.41	0.11	20.63	64.80	97.72	0.94	0.07	0.01	1.09	2.91	5.01	0.93	0.07	0.01
	19	559	10.71	1.57	0.01	20.64	64.76	97.68	0.93	0.08	0.00	1.09	2.91	5.01	0.92	0.07	0.00

	20	590	10.24	1.46	0.05	21.54	63.24	96.48	0.90	0.07	0.00	1.15	2.87	5.00	0.92	0.07	0.00
	21	621	10.74	1.61	0.05	20.83	64.64	97.82	0.94	0.08	0.00	1.10	2.90	5.02	0.92	0.08	0.00
	22	652	10.84	1.58	0.09	20.99	65.38	98.79	0.93	0.08	0.01	1.10	2.90	5.01	0.92	0.07	0.01
	24	714	10.66	1.52	0.19	21.05	65.13	98.56	0.92	0.07	0.01	1.11	2.90	5.01	0.92	0.07	0.01
	25	745	10.43	1.47	0.10	20.92	65.11	98.03	0.90	0.07	0.01	1.10	2.91	4.99	0.92	0.07	0.01
	26	776	10.78	1.54	0.18	20.66	65.14	98.30	0.93	0.07	0.01	1.09	2.91	5.02	0.92	0.07	0.01
	28	838	10.41	1.40	0.07	20.45	64.11	96.38	0.92	0.07	0.00	1.10	2.91	5.00	0.93	0.07	0.00
	29	869	10.78	1.36	0.14	20.61	65.24	98.14	0.93	0.07	0.01	1.09	2.92	5.01	0.93	0.06	0.01
	30	900	10.46	1.33	0.08	20.64	64.60	97.21	0.91	0.06	0.00	1.10	2.91	5.00	0.93	0.07	0.00
Grain 13 T4	2	40	10.67	1.55	0.18	20.35	64.31	97.30	0.94	0.08	0.01	1.08	2.91	5.02	0.92	0.07	0.01
	3	80	10.50	1.49	0.18	20.37	63.99	96.53	0.93	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	4	120	10.62	1.41	0.16	20.27	64.27	96.72	0.93	0.07	0.01	1.08	2.92	5.01	0.92	0.07	0.01
	5	160	10.33	1.41	0.09	20.50	64.37	96.77	0.91	0.07	0.00	1.09	2.91	4.99	0.93	0.07	0.01
	6	200	10.37	1.25	0.18	20.03	63.93	95.77	0.92	0.06	0.01	1.08	2.93	5.00	0.93	0.06	0.01
	7	240	10.49	1.37	0.15	20.34	64.82	97.16	0.92	0.07	0.01	1.08	2.92	5.00	0.92	0.07	0.01
	9	320	10.41	1.43	0.12	20.12	64.56	96.63	0.92	0.07	0.01	1.08	2.93	5.00	0.92	0.07	0.01
	12	440	10.63	1.27	0.13	20.32	65.37	97.73	0.92	0.06	0.01	1.07	2.93	5.00	0.93	0.06	0.01
	13	480	10.94	1.21	0.17	20.54	65.46	98.32	0.95	0.06	0.01	1.08	2.92	5.02	0.93	0.06	0.01
	17	640	10.61	1.04	0.17	20.14	65.33	97.29	0.93	0.05	0.01	1.07	2.94	4.99	0.94	0.05	0.01
	21	800	10.55	1.06	0.14	20.14	64.27	96.16	0.93	0.05	0.01	1.08	2.93	5.00	0.94	0.05	0.01
	22	840	10.58	1.00	0.21	20.12	65.32	97.23	0.92	0.05	0.01	1.07	2.94	4.99	0.94	0.05	0.01
	23	880	10.67	0.90	0.27	19.87	65.03	96.74	0.94	0.04	0.02	1.06	2.94	5.00	0.94	0.04	0.02
	24	920	10.66	0.94	0.12	19.99	65.04	96.76	0.93	0.05	0.01	1.07	2.94	5.00	0.95	0.05	0.01
	25	960	10.48	1.06	0.11	20.06	64.90	96.61	0.92	0.05	0.01	1.07	2.94	4.99	0.94	0.05	0.01
	26	1000	10.94	1.05	0.18	20.55	64.95	97.67	0.95	0.05	0.01	1.09	2.92	5.02	0.94	0.05	0.01
	29	1120	10.47	1.48	0.16	20.37	64.08	96.57	0.92	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	35	1360	10.44	1.43	0.14	20.75	65.12	97.88	0.91	0.07	0.01	1.10	2.92	4.99	0.92	0.07	0.01
	36	1400	10.63	1.44	0.12	20.38	64.55	97.13	0.93	0.07	0.01	1.09	2.92	5.01	0.92	0.07	0.01
	37	1440	10.42	1.43	0.12	20.85	64.24	97.05	0.91	0.07	0.01	1.11	2.90	5.00	0.92	0.07	0.01
	39	1520	10.77	1.51	0.08	20.65	64.63	97.57	0.94	0.07	0.00	1.10	2.91	5.01	0.92	0.07	0.00
	40	1560	10.51	1.54	0.00	19.93	63.67	95.64	0.93	0.08	0.00	1.08	2.92	5.01	0.93	0.07	0.00

Grain 14 T4	1	0	10.67	1.60	0.18	20.82	65.87	99.14	0.92	0.08	0.01	1.09	2.92	5.00	0.91	0.08	0.01
	2	40	10.97	1.13	0.09	20.17	64.66	96.94	0.96	0.05	0.01	1.08	2.93	5.02	0.94	0.05	0.01
	4	120	10.35	1.45	0.11	20.42	64.95	97.27	0.90	0.07	0.01	1.08	2.92	4.99	0.92	0.07	0.01
	5	160	10.40	1.38	0.11	20.52	64.56	96.96	0.91	0.07	0.01	1.09	2.92	4.99	0.93	0.07	0.01
	6	200	10.55	1.33	0.04	20.46	65.05	97.39	0.92	0.06	0.00	1.08	2.92	4.99	0.93	0.07	0.00
	8	280	11.05	1.40	0.12	20.76	66.42	99.75	0.94	0.07	0.01	1.08	2.92	5.01	0.93	0.06	0.01
	10	360	10.83	1.47	0.11	20.47	64.85	97.73	0.94	0.07	0.01	1.08	2.91	5.02	0.92	0.07	0.01
	11	400	10.68	1.16	0.18	20.48	65.23	97.72	0.93	0.06	0.01	1.08	2.93	5.00	0.93	0.06	0.01
	12	440	10.32	1.24	0.23	19.60	64.25	95.63	0.92	0.06	0.01	1.06	2.94	4.99	0.93	0.06	0.01
	13	480	11.02	1.30	0.18	21.15	65.67	99.32	0.94	0.06	0.01	1.10	2.90	5.02	0.93	0.06	0.01
	14	520	10.73	1.15	0.13	19.99	64.90	96.90	0.94	0.06	0.01	1.07	2.94	5.01	0.94	0.06	0.01
	17	640	10.62	1.14	0.16	20.57	65.45	97.93	0.92	0.05	0.01	1.08	2.93	5.00	0.94	0.06	0.01
	20	760	10.62	1.35	0.22	20.42	64.33	96.94	0.93	0.07	0.01	1.09	2.91	5.01	0.92	0.06	0.01
	22	840	10.75	1.53	0.14	20.66	64.84	97.91	0.94	0.07	0.01	1.09	2.91	5.02	0.92	0.07	0.01
	23	880	10.75	1.34	0.20	20.19	64.31	96.78	0.95	0.07	0.01	1.08	2.92	5.02	0.93	0.06	0.01
	24	920	10.41	1.48	0.16	20.29	64.32	96.65	0.92	0.07	0.01	1.09	2.92	5.00	0.92	0.07	0.01
	25	960	10.57	1.52	0.17	20.89	64.94	98.35	0.92	0.07	0.01	1.10	2.90	5.01	0.92	0.07	0.01
	26	1000	10.05	1.56	0.12	20.30	63.69	95.73	0.89	0.08	0.01	1.10	2.92	4.99	0.91	0.08	0.01
	27	1040	10.30	1.50	0.13	20.76	64.56	97.25	0.90	0.07	0.01	1.10	2.91	4.99	0.92	0.07	0.01
	28	1080	10.58	1.48	0.21	20.41	64.41	97.09	0.93	0.07	0.01	1.09	2.91	5.01	0.92	0.07	0.01
	30	1160	10.49	1.43	0.15	20.22	64.28	96.57	0.92	0.07	0.01	1.08	2.92	5.00	0.92	0.07	0.01
	32	1240	10.18	1.53	0.13	20.19	64.10	96.13	0.90	0.07	0.01	1.09	2.92	4.99	0.92	0.08	0.01
	33	1280	10.75	1.46	0.23	20.97	64.84	98.25	0.93	0.07	0.01	1.11	2.90	5.02	0.92	0.07	0.01
	34	1320	10.25	1.35	0.10	20.02	63.86	95.58	0.91	0.07	0.01	1.08	2.93	4.99	0.93	0.07	0.01
	35	1360	10.66	1.49	0.16	20.27	64.26	96.83	0.94	0.07	0.01	1.08	2.91	5.02	0.92	0.07	0.01
	36	1400	10.73	1.41	0.23	20.36	64.73	97.46	0.94	0.07	0.01	1.08	2.92	5.02	0.92	0.07	0.01
	37	1440	10.37	1.38	0.22	20.26	64.20	96.44	0.91	0.07	0.01	1.09	2.92	5.00	0.92	0.07	0.01
	38	1480	10.49	1.32	0.21	20.20	64.34	96.56	0.92	0.06	0.01	1.08	2.92	5.00	0.92	0.06	0.01
	39	1520	10.54	1.43	0.15	20.29	64.28	96.70	0.93	0.07	0.01	1.09	2.92	5.01	0.92	0.07	0.01
Grain 15 T1	1r		10.80	2.01	0.00	20.51	63.91	97.23	0.95	0.10	0.00	1.09	2.89	5.03	0.91	0.09	0.00
	2c		11.20	1.99	0.00	20.45	63.48	97.12	0.99	0.10	0.00	1.10	2.88	5.06	0.91	0.09	0.00
	3r		11.09	2.07	0.00	21.10	64.46	98.72	0.96	0.10	0.00	1.11	2.88	5.05	0.91	0.09	0.00

	4c		10.35	1.95	0.00	20.62	64.05	96.97	0.91	0.10	0.00	1.10	2.90	5.00	0.91	0.09	0.00
	5r		10.48	2.12	0.00	20.61	62.67	95.89	0.99	0.10	0.00	1.12	2.88	5.03	0.91	0.09	0.00
	6c		11.30	2.16	0.00	20.69	63.88	98.03	0.99	0.10	0.00	1.10	2.87	5.07	0.90	0.10	0.00
	7r		10.54	2.28	0.00	20.57	63.93	97.32	0.92	0.11	0.00	1.10	2.89	5.02	0.89	0.11	0.00
	8r		11.53	2.12	0.00	20.80	63.82	97.89	0.98	0.10	0.00	1.11	2.88	5.06	0.91	0.09	0.00
	9c		10.35	1.99	0.00	20.53	63.70	96.56	0.91	0.10	0.00	1.10	2.90	5.01	0.90	0.10	0.00

Table 5.3: Plagioclase analyses from specimen 11E2. Traverses were done across plagioclase touching garnet (T2), plagioclase adjacent to garnet (T3) and plagioclase isolated from garnet in the matrix (T4) with distance being the distance from point A in microns on the traverse.

Grain # and type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 1 T4	5	173	9.58	4.03	0.14	22.45	62.48	98.54	0.83	0.19	0.01	1.19	2.80	5.02	0.81	0.19	0.01
	7	440	9.26	4.26	0.17	23.34	62.26	99.11	0.80	0.20	0.01	1.23	2.78	5.01	0.79	0.20	0.01
Grain 2 T3	1	0	9.07	4.76	0.00	23.55	63.35	100.73	0.77	0.22	0.00	1.22	2.78	5.00	0.77	0.22	0.00
	3	200	9.83	3.70	0.15	23.06	63.05	99.64	0.85	0.18	0.01	1.21	2.80	5.02	0.82	0.17	0.01
	4	300	9.57	3.39	0.16	22.93	63.29	99.18	0.82	0.16	0.01	1.20	2.81	5.00	0.83	0.16	0.01
	6	500	9.57	3.39	0.18	22.19	64.49	99.63	0.82	0.16	0.01	1.16	2.85	4.98	0.83	0.16	0.01
	7	600	9.37	3.61	0.24	22.22	63.54	98.98	0.81	0.17	0.01	1.17	2.83	5.00	0.81	0.17	0.01
	9	800	9.27	4.15	0.17	22.33	62.87	98.62	0.81	0.20	0.01	1.18	2.82	5.00	0.79	0.20	0.01
	10	900	9.10	3.82	0.11	23.25	63.57	99.74	0.78	0.18	0.01	1.21	2.81	4.98	0.81	0.19	0.01
	11	1000	9.55	4.52	0.21	22.06	62.72	98.85	0.83	0.22	0.01	1.17	2.81	5.02	0.78	0.20	0.01
	12	1100	8.81	4.17	0.21	22.71	62.35	98.05	0.77	0.20	0.01	1.20	2.80	4.98	0.78	0.20	0.01
	13	1200	9.47	4.14	0.00	23.14	61.87	98.62	0.82	0.20	0.00	1.22	2.78	5.02	0.81	0.20	0.00
Grain 3 T3	1	0	8.91	5.02	0.09	23.59	61.98	99.50	0.77	0.24	0.00	1.24	2.76	5.01	0.76	0.24	0.00
	2	107	9.12	4.35	0.00	22.73	62.81	99.02	0.79	0.21	0.00	1.20	2.80	4.99	0.79	0.21	0.00
	3	213	8.77	4.16	0.09	22.26	62.45	97.63	0.77	0.20	0.01	1.18	2.82	4.97	0.79	0.21	0.01
	4	320	9.54	3.88	0.00	23.30	62.99	99.71	0.82	0.18	0.00	1.22	2.79	5.01	0.82	0.18	0.00
	5	427	9.81	4.03	0.16	22.17	64.00	100.00	0.84	0.19	0.01	1.15	2.83	5.01	0.81	0.18	0.01
	6	533	9.48	3.80	0.25	23.02	63.86	100.41	0.81	0.18	0.01	1.19	2.81	5.01	0.81	0.18	0.01
	8	747	10.04	3.49	0.04	22.69	63.77	99.99	0.86	0.17	0.00	1.18	2.82	5.02	0.84	0.16	0.00
	9	853	9.22	3.45	0.26	22.33	64.42	99.68	0.79	0.16	0.01	1.16	2.85	4.98	0.82	0.17	0.02
	10	960	9.29	4.41	0.00	23.07	62.69	99.47	0.80	0.21	0.00	1.21	2.79	5.01	0.79	0.21	0.00
Grain 4 T3	1	0	9.37	4.48	0.00	23.30	62.65	99.81	0.81	0.21	0.00	1.22	2.78	5.02	0.79	0.21	0.00
	2	54	9.43	4.26	0.14	22.41	63.31	99.41	0.81	0.20	0.01	1.17	2.81	5.00	0.79	0.20	0.01
	4	163	9.50	3.72	0.05	22.17	63.80	99.19	0.82	0.18	0.00	1.16	2.84	4.99	0.82	0.18	0.00
	5	217	9.73	3.59	0.12	22.47	63.03	98.82	0.84	0.17	0.01	1.18	2.82	5.01	0.83	0.17	0.01
	6	271	9.80	3.35	0.25	22.01	63.62	99.03	0.85	0.16	0.01	1.16	2.84	5.02	0.83	0.16	0.01

	7	325	9.53	3.48	0.06	21.84	63.38	98.23	0.83	0.17	0.00	1.15	2.84	4.99	0.83	0.17	0.00
	8	379	9.87	3.33	0.07	22.87	63.89	99.96	0.84	0.16	0.00	1.19	2.82	5.01	0.84	0.16	0.00
	9	433	8.98	3.90	0.22	22.82	63.46	99.16	0.77	0.19	0.01	1.19	2.82	4.97	0.80	0.19	0.01
	10	488	9.81	3.40	0.10	22.54	63.53	99.28	0.85	0.16	0.01	1.18	2.82	5.01	0.83	0.16	0.01
	11	542	9.42	3.99	0.00	22.57	62.63	98.60	0.82	0.19	0.00	1.19	2.81	5.01	0.81	0.19	0.00
	12	596	9.45	4.47	0.09	23.14	62.96	100.01	0.81	0.21	0.00	1.21	2.79	5.02	0.79	0.21	0.00
	13	650	8.53	4.69	0.44	23.65	62.18	99.49	0.74	0.22	0.03	1.24	2.77	4.99	0.75	0.23	0.03
Grain 5 T3	2	52	8.93	4.14	0.00	23.47	62.40	98.94	0.77	0.20	0.00	1.23	2.78	4.99	0.80	0.20	0.00
	3	104	9.49	4.07	0.41	22.22	63.77	99.96	0.82	0.19	0.02	1.16	2.82	5.02	0.79	0.19	0.02
	4	156	9.47	3.87	0.05	21.93	63.78	99.05	0.82	0.18	0.00	1.15	2.84	4.99	0.81	0.18	0.00
	5	208	10.17	3.49	0.05	22.50	64.00	100.16	0.87	0.17	0.00	1.17	2.82	5.03	0.84	0.16	0.00
	6	260	9.79	3.32	0.00	21.95	64.76	99.82	0.84	0.16	0.00	1.14	2.86	4.99	0.84	0.16	0.00
	7	312	9.66	3.29	0.18	22.10	64.39	99.45	0.83	0.16	0.01	1.15	2.85	4.99	0.83	0.16	0.01
	8	364	9.56	2.78	0.18	22.55	64.02	98.90	0.82	0.13	0.01	1.18	2.84	4.98	0.85	0.14	0.01
	9	416	9.54	3.05	0.11	22.28	64.80	99.67	0.82	0.14	0.01	1.16	2.86	4.97	0.84	0.15	0.01
	10	469	9.73	3.37	0.23	21.48	63.41	98.22	0.85	0.16	0.01	1.14	2.85	5.01	0.83	0.16	0.01
	11	521	10.09	3.05	0.20	21.40	63.35	97.89	0.88	0.15	0.01	1.14	2.85	5.02	0.85	0.14	0.01
	12	573	9.75	2.92	0.30	21.74	64.35	99.05	0.84	0.14	0.02	1.14	2.86	5.00	0.84	0.14	0.02
	13	625	10.05	2.79	0.09	21.66	65.06	99.56	0.86	0.13	0.00	1.13	2.87	4.99	0.86	0.13	0.00
	14	677	9.46	3.16	0.22	22.30	64.31	99.24	0.81	0.15	0.01	1.16	2.85	4.98	0.83	0.15	0.01
	15	729	9.61	3.33	0.14	21.63	63.59	98.81	0.83	0.16	0.01	1.14	2.84	5.00	0.83	0.16	0.01
	16	781	9.92	3.78	0.09	22.16	63.87	99.73	0.85	0.18	0.01	1.16	2.83	5.02	0.82	0.17	0.01
	17	833	9.05	3.91	0.06	22.22	63.75	98.93	0.78	0.19	0.00	1.17	2.84	4.97	0.80	0.19	0.00
Grain 6 T4	1	0	9.07	4.58	0.19	23.34	63.68	100.67	0.77	0.22	0.01	1.21	2.79	4.99	0.77	0.22	0.01
	2	51	9.33	4.10	0.09	23.07	63.06	99.56	0.80	0.20	0.00	1.21	2.80	5.00	0.80	0.19	0.00
	3	103	9.66	4.20	0.00	22.68	63.41	99.95	0.83	0.20	0.00	1.18	2.81	5.02	0.81	0.19	0.00
	4	154	9.28	3.67	0.00	22.73	63.73	99.41	0.80	0.17	0.00	1.19	2.82	4.98	0.82	0.18	0.00
	5	206	9.13	3.91	0.15	21.99	63.05	98.08	0.80	0.19	0.01	1.16	2.83	4.98	0.80	0.19	0.01
	6	257	9.74	4.20	0.09	22.78	63.90	100.62	0.83	0.20	0.01	1.18	2.81	5.02	0.80	0.19	0.00
	8	360	8.79	4.57	0.13	23.35	62.33	99.04	0.76	0.22	0.01	1.23	2.78	4.99	0.77	0.22	0.01
Grain 7 T4	1	0	8.61	4.56	-0.01	23.73	61.87	98.77	0.75	0.22	0.00	1.25	2.77	4.98	0.77	0.23	0.00
	2	55	9.15	3.60	0.19	21.64	62.65	97.04	0.81	0.17	0.01	1.16	2.84	4.98	0.81	0.18	0.01
	3	110	9.87	3.84	0.04	22.77	64.38	100.85	0.84	0.18	0.00	1.18	2.82	5.01	0.82	0.18	0.00

	4	166	9.41	3.77	0.14	22.65	64.35	100.18	0.80	0.18	0.01	1.17	2.83	4.98	0.81	0.18	0.01
	5	221	9.52	4.18	0.15	21.85	63.90	99.45	0.82	0.20	0.01	1.14	2.84	5.00	0.80	0.19	0.01
	6	276	9.62	4.45	0.10	24.29	63.32	101.67	0.81	0.21	0.01	1.25	2.76	5.02	0.79	0.20	0.01
Grain 8 T4	1	0	9.37	4.65	0.00	23.91	63.13	101.07	0.80	0.22	0.00	1.23	2.77	5.01	0.79	0.22	0.00
	2	50	9.43	4.00	0.11	22.57	63.37	99.37	0.81	0.19	0.01	1.18	2.82	5.00	0.81	0.19	0.01
	3	100	9.94	3.70	0.08	22.67	63.25	99.56	0.86	0.18	0.00	1.19	2.81	5.03	0.83	0.17	0.00
	5	201	9.37	3.52	0.20	23.10	63.72	99.71	0.80	0.17	0.01	1.20	2.81	4.99	0.82	0.17	0.01
	6	251	10.14	3.73	0.15	23.26	64.92	102.05	0.85	0.17	0.01	1.19	2.81	5.02	0.82	0.17	0.01
	7	301	9.05	4.02	0.00	22.14	62.40	97.61	0.79	0.19	0.00	1.18	2.82	4.99	0.80	0.20	0.00
	8	351	9.70	3.83	0.14	22.62	62.87	99.55	0.84	0.18	0.01	1.18	2.79	5.01	0.81	0.18	0.01
	9	401	9.21	3.91	0.06	23.53	64.94	101.59	0.77	0.18	0.00	1.20	2.81	4.97	0.81	0.19	0.00
	10	452	9.34	3.92	0.09	22.33	63.05	98.64	0.81	0.19	0.01	1.18	2.82	5.00	0.81	0.19	0.01
	11	502	9.70	4.03	0.05	23.08	63.05	99.86	0.83	0.19	0.00	1.20	2.79	5.02	0.81	0.19	0.00
	12	552	8.86	4.49	0.05	22.79	61.37	97.51	0.78	0.22	0.00	1.22	2.78	5.00	0.78	0.22	0.00
Grain 9 T2	2	52	9.40	4.33	0.20	22.90	62.98	99.62	0.81	0.21	0.01	1.20	2.80	5.01	0.79	0.20	0.01
	3	104	8.71	4.14	0.32	22.90	63.91	99.97	0.75	0.20	0.02	1.19	2.82	4.97	0.78	0.20	0.02
	4	157	9.11	3.78	0.05	22.85	63.41	99.15	0.79	0.18	0.00	1.20	2.82	4.98	0.81	0.19	0.00
	6	261	9.69	3.67	0.08	22.40	63.96	99.74	0.83	0.17	0.00	1.17	2.83	5.00	0.82	0.17	0.00
	7	313	9.42	3.89	0.00	23.07	63.29	99.68	0.81	0.18	0.00	1.20	2.80	5.00	0.81	0.19	0.00
	8	365	8.99	4.11	0.13	22.36	63.53	98.99	0.78	0.20	0.01	1.17	2.83	4.97	0.79	0.20	0.01
	9	418	9.00	4.19	0.00	22.58	63.00	98.77	0.78	0.20	0.00	1.19	2.81	4.98	0.80	0.20	0.00
	10	470	8.49	3.93	1.17	23.82	59.93	97.33	0.75	0.19	0.07	1.28	2.74	5.03	0.74	0.19	0.07
Grain 10 T3	1	0	9.12	3.59	0.37	22.57	62.68	98.33	0.79	0.17	0.02	1.19	2.81	5.00	0.80	0.17	0.02
	2	53	9.69	4.01	0.04	22.13	62.80	98.62	0.84	0.19	0.00	1.17	2.82	5.02	0.81	0.19	0.00
	3	107	9.77	3.69	0.14	21.87	63.91	99.24	0.84	0.18	0.01	1.15	2.84	5.01	0.82	0.17	0.01
	4	160	9.76	3.18	0.17	21.82	64.39	99.16	0.84	0.15	0.01	1.14	2.86	4.99	0.84	0.15	0.01
	6	267	9.68	3.34	0.15	21.97	64.34	99.32	0.83	0.16	0.01	1.15	2.85	4.99	0.83	0.16	0.01
	8	374	9.80	3.49	0.29	22.19	63.73	99.50	0.84	0.17	0.02	1.16	2.83	5.02	0.82	0.16	0.02
	9	428	9.99	3.84	0.19	21.78	62.96	98.57	0.87	0.18	0.01	1.15	2.83	5.03	0.82	0.17	0.01
	11	535	9.43	3.74	0.11	22.72	63.27	99.16	0.81	0.18	0.01	1.19	2.81	5.00	0.82	0.18	0.01
	12	588	9.96	4.41	0.13	23.42	63.96	101.75	0.84	0.21	0.01	1.20	2.79	5.03	0.80	0.20	0.01
Grain 11 T4	2	51	9.49	4.02	0.08	22.30	63.21	99.02	0.82	0.19	0.00	1.17	2.82	5.00	0.81	0.19	0.00
	3	101	9.05	3.75	0.30	22.11	63.06	98.28	0.79	0.18	0.02	1.17	2.83	4.99	0.80	0.18	0.02

	4	152	10.06	3.66	0.21	22.26	64.16	100.15	0.86	0.17	0.01	1.16	2.83	5.02	0.82	0.17	0.01
	5	203	10.15	3.08	0.09	22.24	64.65	100.13	0.87	0.15	0.01	1.15	2.85	5.01	0.85	0.14	0.01
	6	253	9.48	3.15	0.10	21.80	64.66	99.10	0.82	0.15	0.01	1.14	2.87	4.97	0.84	0.15	0.01
	7	304	9.52	2.74	0.23	21.84	64.69	98.79	0.82	0.13	0.01	1.14	2.87	4.97	0.85	0.14	0.01
	8	355	10.52	3.05	0.07	21.82	64.34	99.74	0.90	0.14	0.00	1.14	2.85	5.03	0.86	0.14	0.00
	9	405	10.25	3.07	0.19	21.64	65.06	100.01	0.88	0.14	0.01	1.12	2.87	5.01	0.85	0.14	0.01
	10	456	10.27	2.70	0.12	21.28	64.25	98.49	0.89	0.13	0.01	1.12	2.87	5.01	0.87	0.13	0.01
	11	507	10.24	2.71	0.12	22.10	64.45	99.50	0.88	0.13	0.01	1.15	2.85	5.01	0.87	0.13	0.01
	12	557	10.19	2.65	0.10	21.53	63.89	98.26	0.89	0.13	0.01	1.14	2.86	5.01	0.87	0.13	0.01
	13	608	10.56	2.40	0.07	21.52	65.31	99.78	0.90	0.11	0.00	1.12	2.88	5.01	0.89	0.11	0.00
	14	659	9.68	2.77	0.00	21.63	64.92	99.00	0.83	0.13	0.00	1.13	2.88	4.97	0.87	0.14	0.00
	15	709	10.18	3.06	0.28	21.88	65.34	100.74	0.86	0.14	0.02	1.13	2.86	5.01	0.84	0.14	0.02
	17	811	9.23	3.45	0.18	21.91	63.69	98.28	0.80	0.17	0.01	1.16	2.85	4.97	0.82	0.17	0.01
	18	861	9.78	3.97	0.23	22.81	63.32	99.89	0.84	0.19	0.01	1.19	2.80	5.02	0.81	0.18	0.01
	19	912	9.62	3.47	0.16	22.46	64.05	99.60	0.83	0.16	0.01	1.17	2.83	4.99	0.83	0.16	0.01
Grain 12 T4	2	55	9.44	3.57	0.07	23.18	63.65	100.25	0.80	0.17	0.00	1.20	2.80	4.99	0.82	0.17	0.00
	3	109	9.67	3.72	0.31	22.30	63.29	99.28	0.84	0.18	0.02	1.17	2.82	5.02	0.81	0.17	0.02
	4	164	9.12	3.64	0.04	21.56	63.07	97.38	0.80	0.18	0.00	1.15	2.85	4.97	0.82	0.18	0.00
	7	327	9.41	3.28	0.26	21.92	63.29	98.15	0.82	0.16	0.01	1.16	2.84	4.99	0.83	0.16	0.01
	8	382	10.04	3.48	0.24	22.22	64.02	100.00	0.86	0.17	0.01	1.16	2.83	5.03	0.83	0.16	0.01
	10	491	9.73	3.81	0.00	23.06	63.14	99.74	0.84	0.18	0.00	1.20	2.80	5.02	0.82	0.18	0.00
	11	546	8.81	3.91	0.12	22.12	62.52	97.36	0.77	0.19	0.01	1.18	2.83	4.97	0.80	0.20	0.01
	12	600	9.14	3.84	0.00	22.44	62.89	98.31	0.79	0.18	0.00	1.19	2.82	4.98	0.81	0.19	0.00
Grain 13 T4	3	105	9.36	3.64	0.12	22.30	63.03	98.33	0.81	0.17	0.01	1.18	2.83	4.99	0.82	0.18	0.01
	5	210	9.99	3.15	0.24	22.23	63.13	98.74	0.87	0.15	0.01	1.17	2.83	5.03	0.84	0.15	0.01
	6	263	9.66	3.27	0.29	21.89	64.56	99.66	0.83	0.16	0.02	1.14	2.86	5.00	0.83	0.16	0.02
	7	315	9.39	3.18	0.39	22.45	64.26	99.67	0.80	0.15	0.02	1.17	2.84	4.99	0.82	0.15	0.02
	9	420	9.50	3.19	0.22	21.77	63.89	98.35	0.82	0.15	0.01	1.15	2.86	4.98	0.83	0.15	0.01
	10	473	9.94	3.06	0.18	22.31	64.33	99.64	0.85	0.14	0.01	1.16	2.84	5.00	0.85	0.14	0.01
	12	578	10.12	3.26	0.20	22.36	63.87	99.61	0.87	0.15	0.01	1.17	2.83	5.02	0.84	0.15	0.01
	13	630	9.80	3.20	0.03	22.19	63.71	98.90	0.85	0.15	0.00	1.17	2.84	5.00	0.85	0.15	0.00
	14	683	9.27	3.24	0.24	22.06	64.27	99.07	0.80	0.15	0.01	1.15	2.85	4.97	0.83	0.16	0.01
	15	735	9.43	3.70	0.24	22.07	62.68	98.11	0.82	0.18	0.01	1.17	2.82	5.01	0.81	0.18	0.01

Grain 14 T4	2	103	9.75	3.72	-0.00	22.30	63.71	99.48	0.84	0.18	0.00	1.17	2.83	5.01	0.83	0.17	0.00
	3	206	9.69	3.34	0.15	21.68	64.13	98.83	0.84	0.16	0.01	1.14	2.86	4.99	0.83	0.16	0.01
	4	309	9.82	2.92	0.33	21.99	63.41	98.47	0.85	0.14	0.02	1.16	2.84	5.01	0.84	0.14	0.02
	5	412	10.10	3.00	0.07	21.47	63.61	98.18	0.88	0.14	0.00	1.14	2.86	5.02	0.86	0.14	0.00
	6	515	9.77	2.95	0.21	22.20	63.85	98.77	0.84	0.14	0.01	1.17	2.84	4.99	0.85	0.14	0.01
	7	618	9.90	3.45	0.18	21.38	64.51	99.23	0.85	0.16	0.01	1.12	2.87	5.00	0.83	0.16	0.01
	8	720	10.44	3.14	0.14	22.07	65.18	100.83	0.89	0.15	0.01	1.14	2.85	5.02	0.85	0.14	0.01
	9	823	9.81	2.93	0.34	21.58	63.23	97.89	0.86	0.14	0.02	1.15	2.85	5.02	0.84	0.14	0.02
	10	926	9.40	3.17	0.36	21.38	64.46	98.77	0.81	0.15	0.02	1.12	2.87	4.98	0.83	0.15	0.02
	11	1029	9.77	3.03	0.34	22.25	63.83	99.23	0.84	0.14	0.02	1.17	2.84	5.01	0.84	0.14	0.02
	12	1132	10.06	3.37	0.17	21.88	62.87	98.17	0.88	0.16	0.01	1.16	2.83	5.03	0.84	0.15	0.01
	13	1235	8.90	4.22	0.23	22.24	61.92	97.51	0.78	0.20	0.01	1.19	2.81	5.00	0.78	0.20	0.01
Grain 15 T4	2	54	9.26	3.48	0.08	22.66	63.28	98.68	0.80	0.17	0.00	1.19	2.82	4.98	0.82	0.17	0.00
	3	107	9.72	3.29	0.12	22.19	63.58	98.78	0.84	0.16	0.01	1.17	2.84	5.00	0.84	0.16	0.01
	4	161	9.64	3.10	0.12	22.05	63.81	98.60	0.83	0.15	0.01	1.16	2.85	4.99	0.84	0.15	0.01
	7	321	10.10	3.27	0.20	21.93	64.02	99.31	0.87	0.16	0.01	1.15	2.84	5.02	0.84	0.15	0.01
	8	375	10.35	2.61	0.00	21.88	64.74	99.58	0.89	0.12	0.00	1.14	2.86	5.01	0.88	0.12	0.00
	9	429	9.99	2.76	0.19	21.46	64.04	98.25	0.87	0.13	0.01	1.13	2.87	5.00	0.86	0.13	0.01
	10	482	10.18	2.95	0.20	20.92	63.61	97.65	0.89	0.14	0.01	1.11	2.87	5.02	0.85	0.14	0.01
	11	536	10.43	2.79	0.05	21.05	64.75	99.02	0.90	0.13	0.00	1.10	2.88	5.02	0.87	0.13	0.00
	12	589	9.36	2.96	0.15	21.60	65.18	99.10	0.80	0.14	0.01	1.13	2.88	4.95	0.84	0.15	0.01
	13	643	9.26	3.11	0.12	21.98	63.70	98.05	0.80	0.15	0.01	1.16	2.85	4.97	0.84	0.16	0.01
	15	750	9.12	3.65	0.00	22.46	61.85	97.08	0.80	0.18	0.00	1.20	2.81	4.99	0.82	0.18	0.00
Grain 16 T4	1	0	9.29	4.16	0.00	22.38	62.92	98.75	0.81	0.20	0.00	1.18	2.81	5.00	0.80	0.20	0.00
	2	41	9.54	3.67	0.09	22.10	63.26	98.57	0.83	0.18	0.01	1.17	2.83	5.00	0.82	0.17	0.00
	3	82	9.68	3.46	0.11	22.42	63.68	99.24	0.83	0.16	0.01	1.17	2.83	5.00	0.83	0.16	0.01
	5	163	10.22	3.69	0.28	22.24	63.09	99.51	0.88	0.18	0.02	1.17	2.81	5.05	0.82	0.16	0.01
	6	204	9.95	3.51	0.20	22.14	64.20	99.81	0.85	0.17	0.01	1.15	2.84	5.01	0.83	0.16	0.01
	7	245	9.30	4.00	0.03	23.09	63.04	99.42	0.80	0.19	0.00	1.21	2.80	5.00	0.81	0.19	0.00
Grain 17 T2	1	0	10.86	1.03	0.13	20.32	67.37	99.58	0.92	0.05	0.01	1.05	2.96	4.98	0.94	0.05	0.01
	2	54	9.21	4.42	0.02	23.45	63.14	100.22	0.79	0.21	0.00	1.22	2.78	5.00	0.79	0.21	0.00
	3	107	9.47	3.84	-0.05	22.75	63.24	99.31	0.82	0.18	0.00	1.19	2.81	5.00	0.82	0.18	-0.00
	5	215	9.60	3.80	0.23	21.68	63.83	98.91	0.83	0.18	0.01	1.14	2.85	5.00	0.81	0.18	0.01

	6	269	9.45	3.71	0.00	22.16	62.49	97.81	0.83	0.18	0.00	1.18	2.82	5.00	0.82	0.18	0.00
	7	322	9.13	4.21	0.08	22.96	63.53	99.82	0.78	0.20	0.00	1.20	2.81	4.99	0.79	0.20	0.00
	8	376	8.97	4.13	0.12	23.08	62.71	98.89	0.78	0.20	0.01	1.21	2.80	4.98	0.79	0.20	0.01
Grain 18 T2	2	57	8.91	4.03	0.21	22.71	63.30	98.95	0.77	0.19	0.01	1.19	2.82	4.97	0.79	0.20	0.01
	3	114	9.39	3.97	0.13	22.77	64.43	100.56	0.80	0.19	0.01	1.18	2.82	4.99	0.81	0.19	0.01
	4	172	9.52	3.64	0.16	22.56	63.75	99.48	0.82	0.17	0.01	1.18	2.83	4.99	0.82	0.17	0.01
	5	229	9.61	3.42	0.12	21.92	64.11	99.05	0.83	0.16	0.01	1.15	2.85	4.99	0.83	0.16	0.01
	7	343	9.24	3.63	0.04	22.32	62.76	97.94	0.81	0.17	0.00	1.18	2.82	4.99	0.82	0.18	0.00
Grain 19 T2	1	0	9.30	3.42	0.21	23.09	62.56	99.15	0.80	0.16	0.01	1.21	2.79	5.00	0.82	0.17	0.01
	2	107	9.60	3.69	0.03	21.89	63.57	98.75	0.83	0.18	0.00	1.15	2.84	5.00	0.82	0.17	0.00
	3	213	9.51	3.47	0.27	22.43	63.61	99.29	0.82	0.17	0.02	1.18	2.83	5.00	0.82	0.17	0.02
	4	320	9.49	3.23	0.21	21.23	63.53	97.48	0.83	0.16	0.01	1.13	2.87	4.98	0.83	0.16	0.01
	5	427	9.52	3.11	0.16	22.08	62.84	97.55	0.83	0.15	0.01	1.17	2.84	4.99	0.84	0.15	0.01
	7	640	9.06	4.04	0.10	22.41	63.49	99.00	0.78	0.19	0.01	1.18	2.83	4.98	0.80	0.20	0.01
	8	747	9.89	3.35	0.16	21.75	64.47	99.45	0.85	0.16	0.01	1.14	2.86	5.00	0.84	0.16	0.01
	9	854	9.97	2.93	0.33	21.60	64.89	99.71	0.85	0.14	0.02	1.13	2.87	5.01	0.84	0.14	0.02
	10	960	9.34	2.91	0.22	21.54	63.51	97.30	0.82	0.14	0.01	1.15	2.87	4.97	0.84	0.14	0.01
	11	1067	10.01	3.56	0.08	22.54	62.70	98.82	0.87	0.17	0.00	1.19	2.81	5.03	0.83	0.16	0.00
Grain 20 T2	2	52	10.07	3.09	0.26	21.93	64.23	99.58	0.87	0.15	0.01	1.15	2.85	5.02	0.84	0.14	0.01
	3	105	9.82	2.96	0.15	21.61	65.20	99.60	0.84	0.14	0.01	1.12	2.88	4.98	0.85	0.14	0.01
	4	157	10.14	3.15	0.08	21.86	65.23	100.38	0.86	0.15	0.00	1.13	2.86	5.00	0.85	0.15	0.00
	5	209	9.65	2.89	0.16	22.04	63.82	98.40	0.84	0.14	0.01	1.16	2.85	4.99	0.85	0.14	0.01
	6	262	10.07	2.90	0.25	21.55	63.81	98.57	0.87	0.14	0.01	1.14	2.86	5.02	0.85	0.14	0.01
	7	314	10.22	2.77	0.09	21.68	65.32	99.98	0.87	0.13	0.01	1.12	2.87	5.00	0.87	0.13	0.01
	8	367	9.71	2.66	0.16	21.48	64.74	98.58	0.84	0.13	0.01	1.13	2.88	4.97	0.86	0.13	0.01
	9	419	10.02	2.88	0.11	21.23	63.35	97.48	0.88	0.14	0.01	1.13	2.86	5.01	0.86	0.14	0.01
	10	471	9.79	2.93	0.20	21.51	65.34	99.57	0.84	0.14	0.01	1.12	2.88	4.98	0.85	0.14	0.01
	11	524	9.71	3.38	0.00	22.10	64.15	99.35	0.83	0.16	0.00	1.16	2.84	5.00	0.84	0.16	0.00
	12	576	9.45	3.79	0.10	21.94	62.73	97.91	0.83	0.18	0.01	1.17	2.83	5.00	0.81	0.18	0.01
Grain 21 T3	1	0	8.95	3.87	0.28	22.43	62.87	98.39	0.78	0.19	0.02	1.19	2.82	4.98	0.79	0.19	0.02
	2	107	8.78	3.38	0.59	22.21	63.65	98.60	0.76	0.16	0.03	1.17	2.84	4.97	0.80	0.17	0.04
	3	213	10.08	3.06	0.27	21.87	64.34	99.61	0.87	0.15	0.02	1.14	2.85	5.02	0.84	0.14	0.01
	4	320	9.87	2.90	0.16	21.52	64.68	98.96	0.85	0.14	0.01	1.13	2.87	4.99	0.85	0.14	0.01

	5	427	10.13	2.66	0.31	21.39	63.21	97.70	0.89	0.13	0.02	1.14	2.86	5.03	0.86	0.12	0.02
	6	533	10.27	2.73	0.10	21.26	64.37	98.62	0.89	0.13	0.01	1.12	2.87	5.01	0.87	0.13	0.01
	8	747	10.27	2.68	0.36	21.33	64.78	99.43	0.88	0.13	0.02	1.12	2.87	5.02	0.86	0.12	0.02
	9	853	9.65	2.78	0.16	21.22	64.57	98.21	0.84	0.13	0.01	1.12	2.89	4.97	0.85	0.14	0.01
	10	960	9.67	3.13	0.25	21.84	64.17	99.07	0.83	0.15	0.01	1.14	2.85	5.00	0.84	0.15	0.01
	11	1067	9.78	3.00	0.04	21.24	64.27	98.28	0.85	0.14	0.00	1.12	2.88	4.99	0.85	0.14	0.00
	12	1173	9.47	2.52	0.21	21.30	65.57	98.87	0.81	0.12	0.01	1.11	2.90	4.95	0.86	0.13	0.01
	13	1280	10.61	2.52	0.15	21.65	65.45	100.22	0.90	0.12	0.01	1.12	2.87	5.02	0.88	0.12	0.01
	14	1387	10.32	2.77	0.02	21.39	64.68	99.16	0.89	0.13	0.00	1.12	2.87	5.01	0.87	0.13	0.00
	15	1493	10.21	2.95	0.07	20.94	64.30	98.41	0.89	0.14	0.00	1.10	2.88	5.01	0.86	0.14	0.00
	16	1600	10.00	3.27	0.09	21.32	63.54	98.13	0.87	0.16	0.01	1.13	2.86	5.01	0.84	0.15	0.01
Grain 22 T4	1	0	9.12	3.99	0.12	22.47	63.51	99.10	0.79	0.19	0.01	1.18	2.82	4.98	0.80	0.19	0.01
	2	108	9.49	3.50	0.31	22.24	64.58	100.12	0.81	0.17	0.02	1.15	2.84	4.99	0.82	0.17	0.02
	3	216	9.34	3.27	0.36	21.65	63.37	97.99	0.81	0.16	0.02	1.15	2.85	4.99	0.82	0.16	0.02
	4	324	9.95	3.17	0.28	21.28	64.85	99.52	0.85	0.15	0.02	1.11	2.87	5.01	0.84	0.15	0.02
	5	432	9.56	3.06	0.21	21.09	64.37	98.08	0.83	0.15	0.01	1.11	2.88	4.97	0.84	0.15	0.01
	6	540	9.53	2.79	0.24	21.73	65.09	99.38	0.82	0.13	0.01	1.13	2.88	4.97	0.85	0.14	0.01
	8	756	9.84	2.57	0.40	20.88	64.36	98.05	0.86	0.12	0.02	1.11	2.89	5.00	0.85	0.12	0.02
	9	864	9.72	2.86	0.06	20.88	63.83	97.29	0.85	0.14	0.00	1.11	2.88	4.99	0.86	0.14	0.00
	10	972	9.72	2.70	0.07	21.81	63.53	97.76	0.85	0.13	0.00	1.16	2.86	4.99	0.86	0.13	0.00
	11	1080	10.13	2.77	0.38	21.18	64.00	98.47	0.88	0.13	0.02	1.12	2.87	5.02	0.85	0.13	0.02
	12	1188	10.03	2.76	0.23	21.95	65.19	100.16	0.85	0.13	0.01	1.14	2.87	5.00	0.86	0.13	0.01
Grain 23 T4	1	0	9.38	3.95	0.11	22.22	63.89	99.44	0.81	0.19	0.01	1.16	2.83	4.99	0.81	0.19	0.01
	2	54	9.21	3.53	0.01	22.78	64.09	99.61	0.79	0.17	0.00	1.19	2.83	4.97	0.82	0.17	0.00
	3	108	9.52	3.38	0.15	22.01	63.46	98.36	0.83	0.16	0.01	1.16	2.84	4.99	0.83	0.16	0.01
	5	215	9.32	3.62	0.19	22.42	63.58	98.95	0.80	0.17	0.01	1.18	2.83	4.98	0.81	0.17	0.01
	6	269	10.03	3.02	0.22	21.73	63.66	98.44	0.87	0.14	0.01	1.15	2.85	5.01	0.85	0.14	0.01
	7	323	10.10	3.26	0.28	22.31	64.89	100.84	0.86	0.15	0.02	1.15	2.84	5.02	0.84	0.15	0.02
	8	377	9.37	2.91	0.26	22.63	64.59	99.76	0.80	0.14	0.01	1.18	2.85	4.97	0.84	0.14	0.02
	9	431	10.11	2.88	0.30	21.32	64.58	99.18	0.87	0.14	0.02	1.12	2.87	5.01	0.85	0.13	0.02
	10	485	9.92	2.91	0.08	21.75	63.31	97.89	0.87	0.14	0.00	1.15	2.85	5.01	0.86	0.14	0.00
	12	592	10.20	3.00	0.24	21.99	64.84	100.27	0.87	0.14	0.01	1.14	2.85	5.02	0.85	0.14	0.01
	13	646	9.71	2.83	0.15	21.36	63.10	97.00	0.85	0.14	0.01	1.14	2.86	4.99	0.85	0.14	0.01

	14	700	9.85	3.31	0.21	21.09	63.47	97.72	0.86	0.16	0.01	1.12	2.86	5.01	0.83	0.15	0.01
Grain 24 T4	1	0	9.35	3.66	0.10	22.47	63.87	99.35	0.80	0.17	0.01	1.17	2.83	4.98	0.82	0.18	0.01
	2	53	9.30	2.89	0.20	21.51	64.51	98.22	0.81	0.14	0.01	1.13	2.88	4.96	0.84	0.14	0.01
	3	107	10.09	2.53	0.27	20.76	64.52	98.17	0.88	0.12	0.02	1.10	2.89	5.00	0.87	0.12	0.02
	4	160	9.63	2.45	0.40	21.35	64.54	98.36	0.83	0.12	0.02	1.12	2.88	4.98	0.86	0.12	0.02
	5	213	9.73	2.87	0.08	21.73	65.74	100.08	0.83	0.13	0.00	1.12	2.88	4.97	0.86	0.14	0.00
	6	267	9.70	3.24	0.14	21.85	63.51	98.31	0.84	0.16	0.01	1.15	2.85	5.00	0.84	0.15	0.01
	7	320	10.25	2.75	0.20	21.47	64.19	98.66	0.89	0.13	0.01	1.13	2.87	5.01	0.86	0.13	0.01
	8	373	9.98	2.65	0.16	21.59	64.68	98.89	0.86	0.13	0.01	1.13	2.87	4.99	0.86	0.13	0.01
	9	427	10.27	2.72	0.11	21.69	65.01	99.69	0.88	0.13	0.01	1.13	2.87	5.01	0.87	0.13	0.01
	10	480	10.09	2.94	0.08	21.74	65.20	99.97	0.86	0.14	0.00	1.13	2.87	5.00	0.86	0.14	0.00
	11	533	9.50	3.07	0.02	22.67	63.70	98.94	0.82	0.15	0.00	1.19	2.83	4.98	0.85	0.15	0.00
	12	587	9.31	3.20	0.10	22.51	65.01	100.03	0.79	0.15	0.01	1.16	2.85	4.96	0.84	0.16	0.01
	13	640	9.92	3.08	0.31	21.90	63.79	99.00	0.86	0.15	0.02	1.15	2.84	5.02	0.84	0.14	0.02
	14	693	10.11	3.39	0.05	21.55	63.22	98.28	0.88	0.16	0.00	1.14	2.84	5.03	0.84	0.16	0.00
	15	747	9.50	3.18	0.08	21.96	64.77	99.40	0.81	0.15	0.00	1.14	2.86	4.97	0.84	0.16	0.00
	16	800	9.55	3.43	0.19	21.41	63.91	98.30	0.83	0.16	0.01	1.13	2.86	4.99	0.83	0.16	0.01

Table 5.4: Feldspar analyses from sample 207. Traverses were done across plagioclase touching garnet (T2), plagioclase adjacent to garnet (T3) and plagioclase isolated from garnet in the matrix (T4) with distance being the distance from point A in microns on the traverse. Spot analyses were done on feldspar intergrowths included in garnet (T1).

Grain # and Type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 1 T2	1	0	7.22	6.87	0.15	25.67	61.51	101.28	0.61	0.32	0.01	1.32	2.69	4.95	0.65	0.34	0.01
	2	137	7.66	6.97	0.22	25.64	61.54	101.82	0.65	0.33	0.01	1.32	2.69	4.98	0.66	0.33	0.01
	5	546	7.25	7.18	0.10	25.06	60.38	99.87	0.63	0.34	0.01	1.31	2.69	4.97	0.64	0.35	0.01
Grain 2 T2	4	360	7.56	6.78	0.27	25.00	63.53	103.15	0.63	0.31	0.01	1.27	2.73	4.96	0.66	0.33	0.02
	7	721	7.72	6.55	0.42	25.45	61.51	101.64	0.66	0.31	0.02	1.31	2.69	4.99	0.66	0.31	0.02
	8	840	7.36	7.08	0.27	26.75	63.33	104.79	0.60	0.32	0.01	1.34	2.68	4.96	0.64	0.34	0.02
Grain 3 T2	1	0	7.48	7.27	0.18	26.51	61.99	103.25	0.62	0.34	0.01	1.34	2.67	4.97	0.64	0.35	0.01
	3	284	7.67	7.04	0.37	25.05	61.25	101.38	0.65	0.33	0.02	1.30	2.69	5.00	0.65	0.33	0.02
	4	492	7.29	6.80	0.25	24.65	60.78	99.78	0.63	0.32	0.01	1.29	2.71	4.97	0.65	0.33	0.01
	5	568	7.99	6.26	0.47	25.03	62.99	102.75	0.67	0.29	0.03	1.28	2.72	4.99	0.68	0.29	0.03
	6	710	7.82	6.78	0.26	24.96	60.68	100.50	0.67	0.32	0.01	1.30	2.69	5.00	0.67	0.32	0.01
	7	850	6.98	7.14	0.29	24.77	61.63	100.81	0.60	0.34	0.02	1.29	2.71	4.95	0.63	0.36	0.02
	8	992	6.83	6.00	0.86	26.39	60.13	100.20	0.59	0.28	0.05	1.38	2.67	4.96	0.64	0.31	0.05
	9	1134	7.45	6.88	0.44	24.90	62.23	101.89	0.63	0.32	0.02	1.28	2.72	4.97	0.65	0.33	0.03
Grain 4 T2	1	0	7.51	7.29	0.20	25.62	61.14	101.56	0.64	0.34	0.01	1.32	2.68	4.98	0.64	0.35	0.01
	3	258	7.54	6.90	0.22	24.80	60.52	99.76	0.65	0.33	0.01	1.30	2.70	4.98	0.66	0.33	0.01
	4	387	7.65	6.73	0.17	25.04	61.13	100.55	0.66	0.32	0.01	1.30	2.70	4.98	0.67	0.32	0.01
	5	516	7.50	6.93	0.06	25.65	62.23	102.32	0.63	0.32	0.00	1.31	2.70	4.96	0.66	0.34	0.00
	6	646	8.07	5.37	0.15	23.12	62.30	98.85	0.70	0.26	0.01	1.22	2.78	4.96	0.72	0.27	0.01
Grain 5 T2	1	0	7.27	7.37	0.24	25.72	60.18	100.54	0.62	0.35	0.01	1.34	2.66	4.98	0.63	0.35	0.01
	2	320	9.81	3.35	0.05	22.24	67.04	102.45	0.82	0.15	0.00	1.12	2.88	4.97	0.84	0.16	0.00
	3	480	8.14	5.30	0.29	24.42	61.22	99.37	0.70	0.25	0.02	1.28	2.73	4.99	0.72	0.26	0.02
	4	640	7.74	3.61	1.25	24.48	61.65	98.73	0.67	0.17	0.07	1.29	2.76	4.97	0.73	0.19	0.08
	5	750	6.86	7.13	0.32	24.94	60.71	99.96	0.59	0.34	0.02	1.31	2.70	4.95	0.62	0.36	0.02
	6	800	7.61	6.84	0.33	25.52	61.93	102.23	0.64	0.32	0.02	1.31	2.69	4.98	0.66	0.33	0.02
	7	960	7.45	6.68	0.24	24.74	61.56	100.43	0.64	0.32	0.01	1.29	2.72	4.96	0.66	0.33	0.01
	8	1120	8.49	6.81	0.39	24.67	62.02	102.38	0.72	0.32	0.02	1.27	2.70	5.03	0.68	0.30	0.02
	9	1280	7.69	6.82	0.39	24.82	61.89	101.61	0.65	0.32	0.02	1.28	2.71	4.99	0.66	0.32	0.02

Grain 6 T2	1	0	10.74	0.73	0.00	20.55	69.55	101.57	0.89	0.03	0.00	1.04	2.98	4.95	0.97	0.04	0.00
	2	40	6.87	7.34	0.31	25.79	61.46	101.76	0.58	0.34	0.02	1.33	2.68	4.95	0.62	0.36	0.02
	3	80	7.19	7.64	0.10	25.49	60.32	100.63	0.62	0.36	0.01	1.33	2.67	4.98	0.63	0.37	0.01
Grain 7 T2	1	0	7.13	7.52	0.19	25.42	61.20	101.26	0.61	0.35	0.01	1.31	2.69	4.96	0.62	0.36	0.01
	2	105	7.07	7.51	0.27	26.40	61.42	102.67	0.59	0.35	0.01	1.35	2.66	4.97	0.62	0.36	0.02
	3	110	7.28	7.31	0.54	25.94	60.92	102.58	0.62	0.34	0.03	1.33	2.66	5.00	0.62	0.35	0.03
Grain 8 T2	1	0	8.03	7.09	0.19	25.29	61.64	102.04	0.68	0.33	0.01	1.30	2.69	5.00	0.67	0.32	0.01
	2	124	7.98	6.74	0.34	24.81	61.67	101.54	0.68	0.32	0.02	1.28	2.71	5.00	0.67	0.31	0.02
	3	248	7.96	6.86	0.34	24.87	60.42	100.46	0.69	0.33	0.02	1.30	2.68	5.02	0.66	0.32	0.02
	4	372	7.72	6.76	0.28	25.19	61.71	101.66	0.65	0.32	0.02	1.30	2.70	4.99	0.66	0.32	0.02
	5	497	7.83	6.68	0.32	25.35	61.24	101.41	0.67	0.31	0.02	1.31	2.69	5.00	0.67	0.31	0.02
Grain 9 T4	1	0	7.40	6.90	0.24	25.68	60.98	101.20	0.63	0.32	0.01	1.33	2.68	4.98	0.65	0.34	0.01
	2	139	7.22	6.86	0.40	24.63	60.53	99.64	0.62	0.33	0.02	1.30	2.70	4.97	0.64	0.34	0.02
	3	278	5.49	5.03	5.10	22.96	62.84	101.41	0.47	0.24	0.29	1.20	2.79	4.99	0.47	0.24	0.29
	4	417	8.13	7.09	0.38	24.97	61.68	102.26	0.69	0.33	0.02	1.28	2.69	5.02	0.66	0.32	0.02
	5	556	7.16	7.37	0.24	25.39	61.48	101.64	0.61	0.35	0.01	1.31	2.69	4.97	0.63	0.36	0.01
Grain 10 T4	1	0	7.74	6.14	0.42	24.19	61.10	99.58	0.67	0.29	0.02	1.27	2.73	4.98	0.68	0.30	0.02
	3	152	7.90	7.22	0.22	24.91	60.88	100.91	0.68	0.34	0.01	1.30	2.69	5.00	0.66	0.33	0.01
	4	304	7.40	6.40	0.19	24.26	59.61	99.03	0.65	0.31	0.01	1.29	2.69	4.99	0.67	0.32	0.01
	6	456	7.16	7.39	0.12	24.24	61.16	99.96	0.62	0.35	0.01	1.27	2.72	4.96	0.63	0.36	0.01
	7	608	8.04	6.62	0.12	25.16	62.61	102.42	0.68	0.31	0.01	1.29	2.71	4.98	0.68	0.31	0.01
	8	760	7.74	6.40	0.08	24.86	62.31	101.30	0.66	0.30	0.00	1.28	2.73	4.96	0.68	0.31	0.00
	9	912	8.16	7.11	0.19	25.21	61.48	101.95	0.69	0.33	0.01	1.30	2.69	5.01	0.67	0.32	0.01
	10	1063	7.27	7.23	0.17	25.87	61.70	102.07	0.61	0.34	0.01	1.33	2.68	4.96	0.64	0.35	0.01
Grain 11 T4	1	0	7.15	7.29	0.05	25.64	60.38	100.46	0.61	0.35	0.00	1.34	2.67	4.97	0.64	0.36	0.00
	2	133	7.68	6.56	0.28	25.81	60.64	100.97	0.66	0.31	0.02	1.34	2.67	4.99	0.67	0.32	0.02
	4	399	7.15	7.14	0.26	25.65	61.97	102.18	0.60	0.33	0.01	1.31	2.69	4.96	0.63	0.35	0.02
	5	533	7.79	6.51	0.25	25.84	61.68	102.07	0.66	0.30	0.01	1.33	2.69	4.99	0.67	0.31	0.01
Grain 12 T4	1	0	7.64	7.10	0.29	25.81	61.18	102.01	0.65	0.33	0.02	1.33	2.67	5.00	0.65	0.33	0.02
	3	317	8.51	7.54	0.20	25.52	61.04	102.61	0.72	0.35	0.01	1.31	2.66	5.04	0.66	0.33	0.01
Grain 13 T4	1	0	7.83	6.92	0.07	24.62	61.08	100.44	0.67	0.33	0.00	1.28	2.70	4.99	0.67	0.33	0.00
	2	134	7.85	6.73	0.32	24.90	60.91	100.71	0.67	0.32	0.02	1.30	2.69	5.00	0.67	0.32	0.02
	3	368	8.06	7.17	0.21	25.31	61.75	102.29	0.68	0.33	0.01	1.30	2.69	5.00	0.66	0.33	0.01
	4	401	7.74	7.08	0.31	24.82	61.28	101.23	0.66	0.33	0.02	1.29	2.70	5.00	0.65	0.33	0.02

Grain 14 T4	1	93	7.63	7.00	0.12	25.55	61.55	101.73	0.65	0.33	0.01	1.32	2.69	4.98	0.66	0.33	0.01
	3	279	7.07	6.91	0.37	25.30	61.29	100.94	0.60	0.33	0.02	1.31	2.70	4.96	0.64	0.34	0.02
Grain 15 T1	1		7.63	7.52	0.32	26.00	59.26	100.73	0.66	0.36	0.02	1.36	2.63	5.03	0.64	0.35	0.02
	2		6.97	4.80	2.36	26.64	58.32	99.66	0.61	0.23	0.14	1.41	2.63	5.04	0.62	0.24	0.14
	3		8.87	1.11	0.42	30.49	56.54	98.41	0.77	0.05	0.02	1.62	2.54	5.05	0.91	0.06	0.03
	4		11.41	1.27	0.00	20.65	67.10	100.43	0.97	0.06	0.00	1.06	2.93	5.02	0.94	0.06	0.00
	5		9.48	2.20	1.41	22.93	63.47	99.49	0.82	0.11	0.08	1.20	2.82	5.03	0.82	0.10	0.08
	15		0.00	0.00	16.74	19.99	63.81	98.54	0.00	0.00	1.01	1.00	3.00	5.00	0.00	0.00	1.00
	16		0.00	0.00	16.97	18.35	64.38	99.70	0.00	0.00	1.01	1.01	2.99	5.01	0.00	0.00	1.00
Grain 16 T1	6		0.00	0.00	15.93	19.29	62.28	98.13	0.00	0.00	0.96	1.07	2.94	4.99	0.00	0.00	1.00
	7		7.04	5.01	1.94	26.29	58.58	99.44	0.62	0.24	0.11	1.40	2.64	5.03	0.64	0.25	0.11
	8		10.89	1.20	0.00	20.52	66.65	99.27	0.93	0.06	0.00	1.07	2.94	4.99	0.94	0.06	0.00
	9		1.33	0.00	11.88	27.48	55.60	96.28	0.12	0.00	0.72	1.54	2.64	5.02	0.15	0.00	0.85
	10		8.69	1.19	2.45	23.82	61.72	97.87	0.76	0.06	0.14	1.27	2.79	5.02	0.79	0.06	0.15
	11		7.51	1.69	3.72	26.08	59.68	98.69	0.66	0.08	0.22	1.39	2.70	5.04	0.69	0.09	0.23
	12		2.53	0.50	13.11	19.68	62.37	98.67	0.20	0.03	0.78	1.08	2.91	5.02	0.20	0.02	0.77
	13		8.09	1.20	0.66	29.52	53.95	93.99	0.74	0.06	0.04	1.64	2.54	5.03	0.88	0.07	0.05
	14		7.79	0.72	2.16	27.97	58.22	98.90	0.68	0.04	0.12	1.48	2.62	5.04	0.81	0.04	0.15
Grain 17 T1	17		7.18	8.06	0.32	25.93	58.15	99.63	0.63	0.39	0.02	1.37	2.61	5.02	0.61	0.38	0.02
	18		7.23	8.04	0.33	26.28	58.52	100.40	0.63	0.38	0.02	1.38	2.61	5.02	0.61	0.37	0.02
	19		10.71	2.22	0.39	21.86	65.90	101.08	0.91	0.10	0.02	1.12	2.87	5.03	0.88	0.10	0.02
	20		4.85	2.38	4.96	28.28	54.99	96.03	0.44	0.12	0.30	1.56	2.58	5.01	0.52	0.14	0.35
	21		0.69	0.00	13.24	25.93	57.63	97.49	0.06	0.00	0.79	1.44	2.71	5.00	0.07	0.00	0.93
	22		0.40	0.72	7.27	31.60	52.23	95.80	0.36	0.04	0.44	1.76	2.46	5.06	0.43	0.04	0.52
	23		6.84	8.27	0.27	26.30	58.24	99.92	0.59	0.40	0.02	1.39	2.61	5.00	0.59	0.39	0.02
	24		6.79	8.37	0.40	26.26	58.18	99.99	0.59	0.40	0.02	1.39	2.61	5.01	0.58	0.40	0.02
	25		7.00	8.32	0.26	26.06	57.54	99.17	0.61	0.40	0.02	1.39	2.60	5.02	0.59	0.39	0.01
	26		3.93	3.40	0.54	34.74	48.70	100.56	0.35	0.17	0.03	1.86	2.21	5.05	0.64	0.30	0.06
	27		7.76	3.08	0.00	27.38	54.99	94.69	0.71	0.16	0.00	1.52	2.58	5.02	0.82	0.18	0.00
	28		7.38	8.20	0.24	26.43	57.95	100.20	0.64	0.39	0.01	1.40	2.59	5.04	0.61	0.38	0.01
	29		3.03	0.99	0.33	7.45	56.54	85.85	0.30	0.06	0.02	0.45	2.90	5.03	0.80	0.15	0.06
	30		10.31	2.02	0.58	22.49	64.56	99.96	0.88	0.10	0.03	1.17	2.85	5.03	0.87	0.09	0.03
	31		9.89	1.85	0.73	22.71	64.36	99.53	0.85	0.09	0.04	1.18	2.85	5.01	0.87	0.09	0.04
	32		2.16	0.96	12.84	21.38	61.81	99.15	0.19	0.05	0.76	1.17	2.86	5.03	0.19	0.05	0.76

	33		7.25	1.55	6.51	20.74	65.28	101.33	0.63	0.07	0.37	1.09	2.90	5.05	0.59	0.07	0.35
	34		7.32	7.78	0.51	26.14	58.53	100.28	0.63	0.37	0.03	1.38	2.62	5.03	0.61	0.36	0.03
Grain 18 T1	35		0.00	0.00	11.14	38.89	48.13	98.16	0.00	0.00	0.66	2.13	2.24	5.03	0.00	0.00	1.00
	36		2.13	3.01	4.89	23.88	36.87	71.40	0.27	0.21	0.40	1.80	2.36	5.07	0.30	0.24	0.46
	37		7.81	6.93	0.41	25.44	59.65	100.22	0.67	0.33	0.02	1.34	2.66	5.02	0.66	0.32	0.02
	38		7.66	7.47	0.30	24.99	59.23	99.65	0.67	0.36	0.02	1.32	2.66	5.02	0.64	0.34	0.02
	39		0.59	6.02	0.37	3.23	11.13	98.32	0.06	0.34	0.03	0.20	0.59	4.29	0.14	0.80	0.06

Table 5.5: Plagioclase analyses from sample 208. Traverses were done across plagioclase touching garnet (T2), plagioclase adjacent to garnet (T3) and plagioclase isolated from garnet in the matrix (T4) with distance being the distance from point A in microns on the traverse.

# and Type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{An}	X_{Ab}	X_{Or}
Grain 1 T3	2	117	6.83	7.73	0.55	27.52	60.36	102.99	0.57	0.36	0.03	1.41	2.62	4.98	0.37	0.60	0.03
	3	234	6.22	9.85	0.00	28.05	58.29	102.42	0.53	0.46	0.00	1.45	2.55	4.99	0.47	0.54	0.00
Grain 2 T4	1	0	6.88	8.41	0.05	27.19	60.69	103.16	0.58	0.39	0.00	1.39	2.62	4.97	0.40	0.59	0.00
	2	129	5.98	9.93	0.14	27.69	57.78	101.38	0.51	0.47	0.01	1.44	2.55	4.98	0.47	0.52	0.01
	3	258	7.10	8.40	0.18	27.12	59.84	102.46	0.60	0.39	0.01	1.39	2.61	4.99	0.39	0.60	0.01
	4	387	6.59	8.24	0.08	26.16	60.59	101.58	0.56	0.39	0.00	1.35	2.65	4.95	0.41	0.59	0.00
	5	516	6.23	8.59	0.13	26.74	59.17	100.73	0.53	0.41	0.01	1.39	2.62	4.95	0.43	0.56	0.01
Grain 4 T2	1	0	6.55	8.84	0.05	26.42	59.42	101.23	0.56	0.42	0.00	1.37	2.62	4.97	0.43	0.57	0.00
	2	123	5.96	10.33	0.00	27.65	58.04	101.98	0.51	0.49	0.00	1.43	2.55	4.98	0.49	0.51	0.00
	3	246	5.86	9.26	0.35	26.99	57.85	100.31	0.51	0.44	0.02	1.42	2.58	4.97	0.46	0.52	0.02
Grain 5 T3	1	0	7.05	8.38	0.09	27.57	60.65	103.65	0.59	0.39	0.01	1.40	2.61	4.98	0.39	0.60	0.01
	2	70	6.90	8.33	0.16	26.97	59.19	101.39	0.59	0.39	0.01	1.40	2.61	4.99	0.40	0.59	0.01
	3	140	7.17	8.52	0.08	27.12	60.94	103.76	0.60	0.39	0.00	1.38	2.62	4.99	0.39	060	0.00
Grain 6 T3	1	0	6.49	8.38	0.05	26.34	60.31	101.52	0.55	0.39	0.00	1.36	2.64	4.95	0.42	0.58	0.00
	2	75	7.29	7.51	0.07	26.43	60.76	102.00	0.62	0.35	0.00	1.36	2.65	4.98	0.36	0.63	0.00
	3	150	7.04	8.18	0.04	25.92	60.26	101.40	0.60	0.39	0.00	1.34	2.65	4.98	0.39	0.61	0.00
Grain 8 T4	1	0	7.09	8.26	0.10	26.42	60.85	103.22	0.60	0.38	0.01	1.35	2.64	4.99	0.39	0.60	0.01
	2	75	6.84	8.26	0.22	26.30	59.96	101.36	0.58	0.39	0.01	1.36	2.64	4.97	0.40	0.59	0.01
	3	150	6.98	7.69	0.14	26.79	59.44	101.41	0.60	0.36	0.01	1.39	2.61	4.99	0.38	0.62	0.01
Grain 9 T4	1	0	6.44	8.35	0.26	26.51	61.44	103.00	0.54	0.39	0.01	1.35	2.66	4.95	0.41	0.57	0.02
	2	75	7.33	8.05	0.18	25.83	59.77	100.98	0.63	0.38	0.01	1.35	2.64	5.00	0.37	0.62	0.01
	3	150	6.63	8.14	0.04	26.41	60.63	101.81	0.56	0.38	0.00	1.36	2.65	4.95	0.40	0.59	0.00
Grain 10 T2	1	0	5.76	3.78	1.46	24.29	62.23	100.25	0.49	0.18	0.08	1.27	2.75	4.90	0.24	0.65	0.11
	2	101	5.82	6.79	1.05	25.41	58.84	98.95	0.51	0.33	0.06	1.35	2.65	4.96	0.37	0.57	0.07
	4	303	6.61	10.02	0.08	27.43	58.25	102.30	0.56	0.47	0.00	1.42	2.56	5.01	0.45	0.54	0.00
Grain 11 T3	1	50	7.01	8.32	0.14	26.57	59.56	101.47	0.60	0.39	0.01	1.38	2.62	4.99	0.39	0.60	0.01
	2	100	9.58	3.76	0.00	22.81	66.00	102.14	0.80	0.17	0.00	1.16	2.84	4.98	0.18	0.83	0.00
	3	150	6.31	8.74	0.09	26.56	59.99	101.61	0.54	0.41	0.01	1.37	2.63	4.95	0.43	0.56	0.01

Grain 12 T4	1	0	6.85	8.96	0.14	27.33	59.44	103.29	0.58	0.42	0.01	1.40	2.58	5.00	0.42	0.58	0.01
	2	138	6.55	8.49	0.13	26.79	58.46	100.29	0.57	0.40	0.01	1.41	2.60	4.98	0.41	0.58	0.01
	4	414	7.83	5.90	0.72	26.36	61.50	102.32	0.66	0.27	0.04	1.35	2.67	5.00	0.28	0.68	0.04
	5	552	6.93	8.47	0.19	25.81	60.75	101.95	0.59	0.40	0.01	1.33	2.66	4.97	0.40	0.59	0.01
Grain 13 T4	1	0	6.94	5.34	1.83	25.93	58.62	100.40	0.60	0.26	0.10	1.37	2.63	5.04	0.27	0.63	0.11
	3	206	6.51	9.00	0.23	26.38	60.50	102.39	0.55	0.42	0.01	1.35	2.64	4.96	0.43	0.56	0.01
	5	42	5.68	10.82	0.07	28.23	57.20	101.93	0.49	0.51	0.00	1.47	2.52	4.99	0.51	0.49	0.00
Grain 14 T4	1	0	5.59	10.15	0.18	27.93	58.78	102.45	0.47	0.48	0.01	1.44	2.57	4.95	0.50	0.49	0.01
	2	104	5.91	10.13	0.02	28.23	57.73	102.02	0.50	0.48	0.00	1.46	2.54	4.98	0.49	0.51	0.00
	3	208	5.62	10.74	0.12	27.40	57.97	101.74	0.48	0.51	0.01	1.42	2.56	4.97	0.51	0.48	0.01
Grain 15 T4	1	0	6.67	9.54	0.12	28.70	58.47	103.40	0.56	0.44	0.01	1.47	2.54	5.01	0.44	0.55	0.01
	2	65	5.84	8.17	0.92	28.27	58.04	101.24	0.50	0.39	0.05	1.47	2.56	4.98	0.41	0.53	0.05
	3	130	6.17	10.08	0.12	27.92	57.76	102.68	0.53	0.47	0.01	1.44	2.53	5.01	0.47	0.52	0.01

Table 5.6: Plagioclase analyses from sample 288. Traverses were done across plagioclase touching garnet (T2), plagioclase adjacent to garnet (T3) and plagioclase isolated from garnet in the matrix (T4) with distance being the distance from point A in microns on the traverse.

Grain # and Type	Analysis #	Distance	Oxide percentage						Cations on an 8 (O) basis						Molar fraction		
			Na_2O	CaO	K_2O	Al_2O_3	SiO_2	Total	Na	Ca	K	Al	Si	Total	X_{Ab}	X_{An}	X_{Or}
Grain 1 T2	1	0	7.31	7.98	0.22	26.51	59.72	101.75	0.62	0.38	0.01	1.37	2.62	5.01	0.62	0.37	0.01
	2	28	7.64	7.93	0.33	26.28	60.87	103.05	0.64	0.37	0.02	1.34	2.64	5.02	0.62	0.36	0.02
	3	56	6.90	7.49	0.28	25.49	59.00	99.17	0.60	0.36	0.02	1.35	2.65	4.98	0.61	0.37	0.02
	4	84	7.51	7.79	0.36	26.20	60.40	102.26	0.64	0.36	0.02	1.35	2.64	5.01	0.62	0.36	0.02
	5	112	7.03	7.62	0.18	25.62	59.93	100.38	0.60	0.36	0.01	1.34	2.66	4.98	0.62	0.37	0.01
	6	140	7.22	7.78	0.35	25.77	59.73	100.85	0.62	0.37	0.02	1.35	2.65	5.00	0.61	0.37	0.02
	7	168	7.05	7.81	0.42	26.16	61.00	102.44	0.60	0.36	0.02	1.34	2.66	4.98	0.61	0.37	0.02
	8	196	7.42	7.57	0.34	25.81	58.72	99.85	0.64	0.36	0.02	1.36	2.63	5.02	0.63	0.35	0.02
	9	224	7.05	7.80	0.16	25.60	59.59	100.20	0.61	0.37	0.01	1.34	2.65	4.99	0.61	0.38	0.01
	10	252	7.22	7.91	0.32	26.16	59.20	100.81	0.62	0.38	0.02	1.37	2.63	5.01	0.61	0.37	0.02
Grain 2 T2	1	0	6.82	7.93	0.27	26.41	59.46	100.88	0.58	0.38	0.02	1.38	2.63	4.98	0.60	0.39	0.02
	2	175	7.53	7.22	0.44	25.61	59.55	100.35	0.65	0.34	0.03	1.34	2.65	5.01	0.64	0.34	0.02
	3	350	6.95	7.78	0.37	25.39	59.28	99.78	0.60	0.37	0.02	1.34	2.65	4.99	0.60	0.37	0.02
	4	700	6.69	7.44	0.33	25.37	59.04	98.88	0.58	0.36	0.02	1.35	2.66	4.97	0.61	0.37	0.02
	5	875	7.50	7.76	0.30	25.74	59.19	100.48	0.65	0.37	0.02	1.35	2.64	5.02	0.63	0.36	0.02
	6	1050	7.14	7.64	0.35	25.86	60.12	101.10	0.61	0.36	0.02	1.35	2.65	4.99	0.62	0.36	0.02
	7	1225	7.24	7.33	0.37	25.28	59.24	99.45	0.63	0.35	0.02	1.34	2.66	5.00	0.63	0.35	0.02
	8	1400	7.38	7.59	0.31	25.27	58.97	99.53	0.64	0.37	0.02	1.34	2.65	5.01	0.63	0.36	0.02
	9	1575	7.29	7.03	0.23	25.25	59.67	99.47	0.63	0.34	0.01	1.33	2.67	4.99	0.64	0.34	0.01
	10	1750	6.94	8.45	0.12	26.20	59.18	100.77	0.60	0.40	0.01	1.37	2.62	4.99	0.59	0.40	0.01
Grain 3 T3	1	0	8.04	6.85	0.29	25.72	59.81	100.71	0.69	0.33	0.02	1.34	2.65	5.03	0.67	0.31	0.02
	2	52	7.62	7.32	0.29	25.11	59.10	99.44	0.66	0.35	0.02	1.33	2.66	5.02	0.64	0.34	0.02
	3	104	7.89	7.43	0.31	25.66	60.11	101.40	0.67	0.35	0.02	1.33	2.65	5.03	0.65	0.34	0.02
	4	156	7.39	7.52	0.37	25.43	59.57	100.27	0.64	0.36	0.02	1.34	2.65	5.01	0.63	0.35	0.02
	5	208	7.28	7.48	0.36	25.41	59.03	99.56	0.63	0.36	0.02	1.34	2.65	5.01	0.62	0.35	0.02
	6	260	7.29	7.43	0.39	25.27	59.81	100.20	0.63	0.35	0.02	1.33	2.66	5.00	0.63	0.35	0.02
	7	312	7.54	7.49	0.38	26.26	59.27	100.94	0.65	0.36	0.02	1.37	2.63	5.02	0.63	0.35	0.02
	8	364	6.80	7.67	0.48	25.12	59.15	99.23	0.59	0.37	0.03	1.33	2.66	4.98	0.60	0.37	0.03

	9	417	7.14	7.65	0.44	25.76	58.84	100.04	0.62	0.37	0.03	1.36	2.63	5.01	0.61	0.36	0.02
	10	469	7.02	7.82	0.32	25.52	58.97	99.64	0.61	0.38	0.02	1.35	2.64	5.00	0.61	0.37	0.02
	11	521	7.52	7.58	0.35	25.76	59.65	100.86	0.65	0.36	0.02	1.35	2.64	5.02	0.63	0.35	0.02
	12	573	7.19	7.29	0.42	25.45	58.88	99.23	0.63	0.35	0.02	1.35	2.65	5.00	0.63	0.35	0.02
	13	625	7.69	7.21	0.39	25.23	59.35	99.87	0.67	0.35	0.02	1.33	2.66	5.02	0.64	0.33	0.02
	14	677	7.73	7.21	0.32	25.63	59.25	100.13	0.67	0.34	0.02	1.35	2.64	5.02	0.65	0.33	0.02
	15	729	7.43	7.69	0.28	25.94	59.10	100.43	0.64	0.37	0.02	1.36	2.63	5.02	0.63	0.36	0.02
Grain 4 T4	1	0	7.62	7.39	0.29	25.69	59.20	100.19	0.66	0.35	0.02	1.35	2.64	5.02	0.64	0.34	0.02
	2	47	7.37	7.68	0.38	26.10	59.63	101.15	0.63	0.36	0.02	1.36	2.64	5.01	0.62	0.36	0.02
	3	94	7.71	6.98	0.40	25.13	59.83	100.05	0.67	0.33	0.02	1.32	2.67	5.01	0.65	0.33	0.02
	4	141	7.87	7.47	0.43	25.39	59.15	100.31	0.68	0.36	0.02	1.34	2.64	5.04	0.64	0.34	0.02
	5	188	7.67	7.15	0.31	25.45	59.11	99.69	0.67	0.34	0.02	1.34	2.65	5.02	0.65	0.33	0.02
	6	234	7.64	7.32	0.39	25.70	59.12	100.39	0.66	0.35	0.02	1.35	2.63	5.03	0.64	0.34	0.02
	7	281	7.14	7.10	0.33	25.26	58.54	98.38	0.63	0.34	0.02	1.35	2.65	4.99	0.63	0.35	0.02
	8	328	7.78	7.34	0.37	25.44	59.25	100.18	0.67	0.35	0.02	1.34	2.65	5.03	0.64	0.34	0.02
	9	375	7.41	7.29	0.34	25.50	59.64	100.18	0.64	0.35	0.02	1.34	2.66	5.00	0.64	0.35	0.02
	10	422	7.61	7.45	0.25	25.43	59.37	100.11	0.66	0.36	0.01	1.34	2.65	5.02	0.64	0.35	0.01
	11	469	7.39	7.32	0.33	25.26	59.32	99.89	0.64	0.35	0.02	1.33	2.66	5.01	0.63	0.35	0.02
	12	516	7.40	7.47	0.30	25.79	59.26	100.22	0.64	0.36	0.02	1.36	2.64	5.01	0.63	0.35	0.02
	13	563	7.16	7.43	0.38	24.74	57.28	97.00	0.64	0.37	0.02	1.35	2.64	5.02	0.62	0.36	0.02
	14	609	6.12	6.73	0.43	21.06	50.31	84.65	0.63	0.38	0.03	1.31	2.66	5.01	0.60	0.37	0.03
	15	656	6.43	6.51	0.18	21.05	51.00	85.17	0.65	0.37	0.01	1.30	2.67	5.01	0.63	0.35	0.01
	16	703	7.46	7.43	0.17	25.69	59.70	100.46	0.64	0.35	0.01	1.35	2.65	5.00	0.64	0.35	0.01
	17	750	7.75	6.72	0.37	25.55	59.59	99.97	0.67	0.32	0.02	1.34	2.66	5.02	0.66	0.32	0.02
Grain 5 T4	1	0	5.96	6.01	0.71	26.27	54.21	93.38	0.55	0.31	0.04	1.48	2.58	4.98	0.61	0.34	0.05
	2	42	7.21	7.24	0.29	25.41	59.59	99.74	0.62	0.35	0.02	1.34	2.66	4.99	0.63	0.35	0.02
	3	83	7.15	7.33	0.23	25.21	59.74	99.66	0.62	0.35	0.01	1.33	2.67	4.98	0.63	0.36	0.01
	4	125	7.98	7.40	0.37	25.73	59.34	100.83	0.69	0.35	0.02	1.35	2.64	5.04	0.65	0.33	0.02
	5	167	7.79	7.34	0.37	25.65	59.94	101.31	0.67	0.35	0.02	1.33	2.65	5.03	0.64	0.34	0.02
	6	208	7.61	7.12	0.31	25.68	59.72	100.44	0.66	0.34	0.02	1.35	2.65	5.01	0.65	0.33	0.02
	7	250	7.79	7.33	0.32	25.93	59.60	100.97	0.67	0.35	0.02	1.35	2.64	5.03	0.65	0.34	0.02
Grain 6 T4	1	0	6.61	6.53	0.90	24.89	54.66	93.86	0.61	0.33	0.06	1.40	2.61	5.02	0.61	0.33	0.05
	2	52	7.59	7.53	0.20	25.77	59.04	100.12	0.66	0.36	0.01	1.36	2.64	5.02	0.64	0.35	0.01
	3	105	7.74	7.28	0.37	25.66	59.58	100.63	0.67	0.35	0.02	1.34	2.65	5.02	0.64	0.34	0.02
	4	157	7.37	7.31	0.42	25.13	59.52	100.03	0.64	0.35	0.02	1.32	2.66	5.01	0.63	0.35	0.02

	5	209	7.95	7.38	0.30	25.87	59.97	101.47	0.68	0.35	0.02	1.34	2.64	5.03	0.65	0.33	0.02
	6	261	7.45	7.27	0.40	25.48	59.21	99.82	0.65	0.35	0.02	1.34	2.65	5.01	0.64	0.34	0.02
	7	314	7.75	7.32	0.36	25.06	59.29	99.79	0.67	0.35	0.02	1.32	2.66	5.03	0.64	0.34	0.02
	8	366	7.82	6.86	0.50	24.94	59.24	99.84	0.68	0.33	0.03	1.32	2.66	5.03	0.66	0.32	0.03
	9	418	7.49	7.15	0.34	25.75	59.61	100.33	0.65	0.34	0.02	1.35	2.65	5.01	0.64	0.34	0.02
	10	471	7.76	7.05	0.40	25.53	59.68	100.42	0.67	0.34	0.02	1.34	2.66	5.02	0.65	0.33	0.02
	11	523	7.37	7.03	0.43	25.37	59.45	99.64	0.64	0.34	0.02	1.34	2.66	5.00	0.64	0.34	0.02
	12	575	7.94	7.17	0.31	25.23	60.21	100.86	0.68	0.34	0.02	1.32	2.67	5.02	0.66	0.33	0.02
	13	627	7.33	7.17	0.33	25.80	59.53	100.16	0.63	0.34	0.02	1.35	2.65	5.00	0.64	0.34	0.02
	14	680	7.73	7.07	0.37	25.06	59.74	99.97	0.67	0.34	0.02	1.32	2.67	5.02	0.65	0.33	0.02
	15	732	7.50	7.17	0.38	25.13	59.23	99.40	0.65	0.35	0.02	1.33	2.66	5.01	0.64	0.34	0.02
	16	784	7.58	7.21	0.37	25.49	59.67	100.32	0.65	0.34	0.02	1.34	2.66	5.01	0.64	0.34	0.02
	17	837	7.86	7.38	0.29	25.63	59.54	100.97	0.68	0.35	0.02	1.34	2.64	5.04	0.65	0.34	0.02
	18	889	7.58	7.88	0.20	25.95	59.12	100.72	0.65	0.38	0.01	1.36	2.63	5.03	0.63	0.36	0.01
Grain 7 T4	1	0	6.95	8.14	0.20	26.21	58.88	100.91	0.60	0.39	0.01	1.37	2.61	5.01	0.60	0.39	0.01
	2	53	7.81	7.50	0.35	25.59	59.39	100.64	0.67	0.36	0.02	1.34	2.64	5.03	0.64	0.34	0.02
	3	106	7.47	7.54	0.28	25.61	60.29	101.18	0.64	0.36	0.02	1.33	2.66	5.00	0.63	0.35	0.02
	4	160	7.47	7.40	0.42	25.81	59.05	100.15	0.65	0.35	0.02	1.36	2.64	5.02	0.63	0.35	0.02
	5	213	7.30	7.21	0.44	25.23	58.20	98.37	0.64	0.35	0.03	1.35	2.64	5.01	0.63	0.34	0.02
	6	266	7.91	7.10	0.39	25.48	59.67	100.82	0.68	0.34	0.02	1.33	2.65	5.04	0.65	0.32	0.02
	7	319	7.44	7.31	0.45	25.59	59.42	100.41	0.64	0.35	0.03	1.34	2.64	5.01	0.63	0.34	0.02
	8	373	7.84	6.93	0.33	25.42	59.88	100.40	0.68	0.33	0.02	1.33	2.66	5.02	0.66	0.32	0.02
	9	426	7.45	7.18	0.42	25.50	59.46	100.01	0.65	0.34	0.02	1.34	2.65	5.01	0.64	0.34	0.02
	10	479	4.22	4.60	0.28	17.33	36.52	63.54	0.58	0.35	0.03	1.44	2.58	5.00	0.61	0.37	0.03
Grain 8 T4	1	0	7.25	7.59	0.27	25.81	59.01	99.93	0.63	0.36	0.02	1.36	2.64	5.00	0.62	0.36	0.02
	2	51	7.57	7.18	0.31	25.55	59.09	99.70	0.66	0.34	0.02	1.35	2.65	5.02	0.64	0.34	0.02
	3	102	7.61	7.31	0.37	25.24	59.43	99.95	0.66	0.35	0.02	1.33	2.66	5.02	0.64	0.34	0.02
	4	153	7.51	7.31	0.21	25.66	58.95	99.63	0.65	0.35	0.01	1.36	2.64	5.01	0.64	0.35	0.01
	5	203	7.65	7.22	0.38	25.62	59.36	100.42	0.66	0.34	0.02	1.34	2.64	5.02	0.64	0.34	0.02
	6	254	7.82	7.03	0.26	25.46	59.52	100.09	0.68	0.34	0.02	1.34	2.66	5.02	0.66	0.33	0.01
	7	305	7.52	7.51	0.32	25.44	59.48	100.26	0.65	0.36	0.02	1.34	2.65	5.01	0.63	0.35	0.02
	8	356	7.17	7.19	0.21	24.91	58.14	97.63	0.64	0.35	0.01	1.34	2.66	5.00	0.64	0.35	0.01
	9	407	7.58	7.62	0.34	25.78	59.37	100.69	0.65	0.36	0.02	1.35	2.64	5.02	0.63	0.35	0.02
	10	458	7.55	7.65	0.26	25.69	58.99	100.14	0.65	0.37	0.02	1.35	2.64	5.02	0.63	0.35	0.01
	11	509	7.34	7.27	0.22	25.55	59.09	99.48	0.64	0.35	0.01	1.35	2.65	5.00	0.64	0.35	0.01

	12	559	7.51	7.64	0.37	26.07	59.71	101.28	0.64	0.36	0.02	1.36	2.64	5.02	0.63	0.35	0.02
	13	610	8.06	7.22	0.29	26.06	59.51	101.36	0.69	0.34	0.02	1.36	2.63	5.05	0.66	0.33	0.02
	14	661	7.88	7.40	0.29	25.64	58.98	100.40	0.68	0.35	0.02	1.35	2.63	5.04	0.65	0.34	0.02
	15	712	7.72	7.51	0.26	26.06	59.60	101.14	0.66	0.36	0.01	1.36	2.63	5.02	0.64	0.34	0.01
Grain 9 T4	1	0	5.02	4.12	2.33	23.42	51.38	87.66	0.50	0.23	0.15	1.41	2.63	4.99	0.57	0.26	0.17
	2	107	7.50	7.18	0.35	25.36	59.22	99.62	0.65	0.34	0.02	1.34	2.65	5.01	0.64	0.34	0.02
	3	215	7.36	7.20	0.36	25.56	59.59	100.08	0.64	0.34	0.02	1.34	2.66	5.00	0.64	0.34	0.02
	4	322	7.32	7.68	0.21	26.20	59.03	100.67	0.63	0.37	0.01	1.37	2.62	5.01	0.63	0.36	0.01
	5	430	7.20	7.89	0.19	26.23	59.29	100.80	0.62	0.37	0.01	1.37	2.63	5.00	0.62	0.37	0.01
	6	537	8.37	6.58	0.25	24.61	59.68	99.49	0.73	0.32	0.01	1.30	2.68	5.04	0.69	0.30	0.01
	7	644	8.40	3.78	0.91	24.23	62.22	99.54	0.72	0.18	0.05	1.27	2.76	4.99	0.76	0.19	0.05
	8	752	7.77	7.30	0.29	25.90	59.99	101.49	0.66	0.34	0.02	1.35	2.64	5.02	0.65	0.34	0.02
	9	859	7.33	7.31	0.30	25.72	59.30	99.97	0.63	0.35	0.02	1.35	2.65	5.00	0.63	0.35	0.02
	10	966	7.38	7.70	0.39	25.78	59.73	100.98	0.63	0.37	0.02	1.35	2.64	5.01	0.62	0.36	0.02
	11	1074	7.37	7.42	0.22	25.90	59.18	100.09	0.64	0.35	0.01	1.36	2.64	5.01	0.63	0.35	0.01
	12	1181	7.54	7.35	0.34	25.46	60.40	101.09	0.65	0.35	0.02	1.32	2.67	5.00	0.64	0.34	0.02
	13	1289	7.65	7.52	0.25	25.93	59.15	100.50	0.66	0.36	0.01	1.36	2.63	5.03	0.64	0.35	0.01
	14	1396	7.46	7.39	0.25	25.40	59.45	99.94	0.65	0.35	0.01	1.34	2.66	5.01	0.64	0.35	0.01
	15	1503	8.61	5.44	0.16	24.22	61.99	100.66	0.74	0.26	0.01	1.26	2.74	5.01	0.73	0.26	0.01
	16	1611	7.53	7.53	0.24	25.42	59.50	100.21	0.65	0.36	0.01	1.34	2.65	5.01	0.64	0.35	0.01
Grain 10 T4	1	0	7.86	7.33	0.29	25.46	59.76	100.71	0.68	0.35	0.02	1.33	2.65	5.03	0.65	0.33	0.02
	2	105	7.95	7.07	0.36	25.69	60.35	101.41	0.68	0.33	0.02	1.33	2.66	5.02	0.66	0.32	0.02
	3	210	7.59	7.16	0.40	25.73	59.34	100.22	0.66	0.34	0.02	1.35	2.65	5.02	0.64	0.33	0.02
	4	315	9.07	1.99	2.42	30.42	63.24	107.13	0.73	0.09	0.13	1.49	2.63	5.06	0.77	0.09	0.14
	5	420	7.38	7.24	0.36	23.95	56.00	94.92	0.68	0.37	0.02	1.33	2.64	5.04	0.64	0.34	0.02
	6	525	7.47	7.07	0.38	25.34	59.28	99.54	0.65	0.34	0.02	1.34	2.66	5.01	0.64	0.34	0.02
	7	630	7.77	6.86	0.36	25.60	59.53	100.39	0.67	0.33	0.02	1.34	2.65	5.02	0.66	0.32	0.02
	8	735	8.24	6.37	0.27	24.66	60.47	100.00	0.71	0.30	0.02	1.30	2.69	5.02	0.69	0.29	0.01
	9	840	7.71	7.13	0.28	25.66	59.83	100.62	0.66	0.34	0.02	1.34	2.65	5.01	0.65	0.33	0.02
	10	945	7.23	7.33	0.20	25.61	58.90	99.27	0.63	0.35	0.01	1.36	2.65	5.00	0.63	0.35	0.01
	11	1050	6.91	7.99	0.15	25.90	58.82	99.76	0.60	0.38	0.01	1.37	2.63	4.99	0.60	0.39	0.01

APPENDIX 6: MUSCOVITE ANALYSES

Table 6.1: Muscovite analyses from sample 100 with 'r' indicating a rim analysis and 'c' representing a core analysis.

	Oxide percentage								Cations on an 11 (O) basis							
#	Na_2O	K_2O	SiO_2	Al_2O_3	FeO	MgO	TiO_2	Total	Na	K	Si	Al	Fe	Mg	Ti	Total
1c	0.28	7.72	47.42	35.29	1.40	0.97	1.26	94.35	0.04	0.65	3.12	2.74	0.08	0.10	0.06	6.79
1r	0.28	8.01	47.17	35.67	1.29	0.94	0.56	93.93	0.04	0.68	3.12	2.78	0.07	0.09	0.03	6.81
2c	0.09	8.30	47.49	36.00	1.23	0.83	0.18	93.84	0.01	0.70	3.14	2.81	0.07	0.08	0.01	6.80
2r	0.07	8.36	47.10	35.59	1.75	0.78	0.40	93.97	0.01	0.71	3.13	2.79	0.10	0.08	0.02	6.81
3c	0.22	8.82	46.28	35.38	1.56	1.04	0.75	93.83	0.03	0.75	3.09	2.78	0.09	0.10	0.04	6.86
3r	0.25	8.61	47.40	34.91	1.50	1.09	0.88	94.64	0.03	0.73	3.13	2.72	0.08	0.11	0.04	6.84
4c	0.29	8.84	47.15	35.28	1.52	1.14	0.63	94.85	0.04	0.75	3.11	2.75	0.08	0.11	0.03	6.87
4r	0.16	8.31	47.05	35.63	1.56	1.03	0.47	94.04	0.02	0.70	3.12	2.78	0.09	0.10	0.02	6.82
5c	0.12	8.59	46.48	35.52	1.59	1.18	0.68	94.04	0.02	0.73	3.09	2.79	0.09	0.12	0.03	6.85
5r	0.21	8.34	47.04	35.73	1.85	1.26	0.66	94.88	0.03	0.70	3.10	2.77	0.10	0.12	0.03	6.83
6c	0.25	8.46	47.38	36.14	1.38	0.85	0.70	95.16	0.03	0.71	3.11	2.79	0.08	0.08	0.03	6.83
6r	0.13	8.32	46.13	36.10	2.18	0.97	0.43	94.12	0.02	0.71	3.07	2.83	0.12	0.10	0.02	6.85

Table 6.2: Muscovite analyses from sample 31A with 'c' representing a core analysis.

	Oxide percentage								Cations on a 11 (O) basis							
#	Na_2O	K_2O	SiO_2	Al_2O_3	FeO	MgO	TiO_2	Total	Na	K	Si	Al	Fe	Mg	Ti	Total
1c	0.48	10.50	46.04	33.98	1.34	1.13	0.83	94.30	0.06	0.90	3.10	2.70	0.08	0.11	0.04	6.99
3c	0.46	10.10	46.52	34.21	1.29	1.23	1.01	94.82	0.06	0.86	3.10	2.69	0.07	0.12	0.05	6.96
4c	0.23	10.20	46.61	33.93	1.32	1.01	0.81	94.14	0.03	0.87	3.13	2.69	0.07	0.10	0.04	6.94
5c	0.29	10.33	46.09	34.36	1.33	1.14	0.94	94.49	0.04	0.88	3.09	2.72	0.07	0.11	0.05	6.96
6c	0.27	10.14	46.20	33.85	1.28	1.07	0.83	93.64	0.04	0.87	3.12	2.69	0.07	0.11	0.04	6.95
7c	0.58	10.23	44.81	33.55	1.45	0.99	1.04	92.75	0.08	0.90	3.07	2.71	0.08	0.10	0.05	7.00
8c	0.53	10.02	45.98	33.78	1.53	1.22	1.18	94.40	0.07	0.86	3.09	2.68	0.09	0.12	0.06	6.97

Table 6.3: Muscovite analyses from sample 208 with ‘r’ indicating a rim analysis and ‘c’ representing a core analysis.

	Oxide percentage								Cations on an 11 (O) basis							
#	Na_2O	K_2O	SiO_2	Al_2O_3	FeO	MgO	TiO_2	Total	Na	K	Si	Al	Fe	Mg	Ti	Total
1c1	0.00	9.04	47.51	35.26	1.65	1.37	1.00	95.82	0.00	0.76	3.11	2.72	0.09	0.13	0.05	6.86
1r1	0.00	8.83	46.78	34.49	1.62	1.12	1.21	94.06	0.00	0.75	3.12	2.71	0.09	0.11	0.06	6.84
1c2	0.53	9.33	46.93	34.39	1.79	1.25	1.19	95.40	0.07	0.79	3.11	2.68	0.10	0.12	0.06	6.92
1r2	0.48	9.09	46.10	33.60	1.53	1.21	1.14	93.15	0.06	0.78	3.12	2.68	0.09	0.12	0.06	6.91
2c	0.00	8.79	46.98	34.81	1.48	1.09	1.37	94.53	0.00	0.74	3.11	2.72	0.08	0.11	0.07	6.83
2r	0.00	9.11	46.51	34.11	1.47	1.24	1.35	93.78	0.00	0.78	3.12	2.69	0.08	0.12	0.07	6.86
3c	0.00	9.16	45.64	35.38	1.48	1.12	1.24	94.03	0.00	0.78	3.05	2.79	0.08	0.11	0.06	6.88
3r	0.44	9.28	45.88	34.65	1.43	1.21	0.98	93.87	0.06	0.80	3.08	2.74	0.08	0.12	0.05	6.93
4c	0.56	9.05	46.91	34.98	1.59	1.43	1.00	95.52	0.07	0.76	3.09	2.72	0.09	0.14	0.05	6.92
4r	0.00	8.97	46.06	34.75	1.31	1.08	1.03	93.20	0.00	0.77	3.10	2.76	0.07	0.11	0.05	6.86
5c	0.00	8.92	46.98	34.54	1.31	1.29	1.19	94.22	0.00	0.76	3.12	2.71	0.07	0.13	0.06	6.84
5r	0.45	9.45	46.75	36.17	0.95	0.97	0.75	95.48	0.06	0.79	3.08	2.80	0.05	0.10	0.04	6.91
6c	0.41	8.81	46.82	35.25	1.12	1.01	1.13	94.54	0.05	0.74	3.10	2.75	0.06	0.10	0.06	6.87
6r	0.00	9.18	46.32	34.28	1.31	1.10	0.84	93.03	0.00	0.79	3.12	2.73	0.07	0.11	0.04	6.87
7c	0.00	9.10	45.90	34.73	1.28	1.08	0.88	92.96	0.00	0.78	3.10	2.76	0.07	0.11	0.04	6.87
7r	0.00	9.21	46.77	34.52	1.62	1.42	1.10	94.63	0.00	0.78	3.11	2.70	0.09	0.14	0.06	6.88

APPENDIX 7: COMPOSITIONS USED FOR THERMOBAROMETRY

Table 7.1: Compositions used for thermobarometry.

					Garnet							Plagioclase			
Slice/ location	Sample	Description	Isopleth	label	Analyses	X_{Grs}	X_{Sps}	X_{Alm}	X_{Prp}	X_{Frp}	X_{Mg}	Analyses	X_{Ab}	X_{An}	X_{Or}
#1	100	Prograde conditions crossing reaction [R1]	GASP	P1	Grs enriched zone	0.20	0.03	0.61	0.17	0.78	0.22	Most An rich subsolidus core	0.61	0.38	0.01
			GASP	P2	Grs enriched zone	0.17	0.03	0.62	0.18	0.77	0.23	Most An rich subsolidus core	0.61	0.38	0.01
			GASP	P3	Grs enriched zone	0.14	0.03	0.61	0.22	0.74	0.26	Most An rich subsolidus core	0.61	0.38	0.01
			GASP	P4	Grs enriched zone	0.14	0.03	0.66	0.17	0.80	0.20	Most An rich subsolidus core	0.61	0.38	0.01
		Maximum T	X_{Fe}		lowest X_{Fe}	0.09	0.03	0.63	0.24	0.72	0.28				
		Melt crystallization	GASP	R1	garnet rim	0.10	0.03	0.66	0.21	0.76	0.24	Rim adjacent to garnet	0.66	0.33	0.01
			X_{Fe}		garnet rim	0.10	0.03	0.66	0.21	0.76	0.24				
#2	11E1	Prograde conditions crossing reaction [R1]	GASP	P1	Grs enriched zone	0.03	0.02	0.64	0.31	0.67	0.33	Most An rich core	0.91	0.09	0.00
		Maximum T	X_{Fe}		lowest X_{Fe}	0.02	0.03	0.63	0.32	0.66	0.34				
		Melt crystallization	GASP	R1	garnet rim	0.01	0.02	0.70	0.27	0.72	0.28	Rim adjacent to garnet	0.93	0.07	0.00
			X_{Fe}		garnet rim	0.01	0.02	0.70	0.27	0.72	0.28				
#3	207	Prograde conditions crossing reaction [R1]	GASP	P1	Grs enriched zone	0.13	0.01	0.66	0.20	0.77	0.23	Most An rich core	0.36	0.63	0.01
			GASP	P2	Grs enriched zone	0.14	0.01	0.67	0.18	0.78	0.22	Most An rich core	0.36	0.63	0.01
			GASP	P3	Grs enriched zone	0.12	0.01	0.68	0.19	0.78	0.22	Most An rich core	0.36	0.63	0.01
			GASP	P4	Grs enriched zone	0.16	0.01	0.65	0.18	0.78	0.22	Most An rich core	0.36	0.63	0.01

#3	207	Maximum T	X_{Fe}		lowest X_{Fe}	0.08	0.02	0.69	0.21	0.76	0.24				
		Melt crystallization	GASP	R1	garnet rim	0.10	0.02	0.70	0.18	0.79	0.21	Rim adjacent to garnet	0.34	0.65	0.01
			GASP	R2	garnet rim	0.10	0.02	0.70	0.18	0.79	0.21	Rim adjacent to garnet	0.35	0.62	0.03
			GASP	R3	garnet rim	0.10	0.02	0.70	0.18	0.79	0.21	Rim adjacent to garnet	0.35	0.64	0.01
			X_{Fe}		garnet rim	0.10	0.02	0.70	0.18	0.79	0.21				
	208	Prograde conditions crossing reaction [R1]	GASP	P5	garnet core	0.16	0.02	0.60	0.22	0.73	0.27	Most An rich subsolidus core	0.51	0.49	0.00
		Maximum T	X_{Fe}		lowest X_{Fe}	0.24	0.03	0.59	0.14	0.71	0.29				
		Melt crystallization	GASP	R4	garnet rim	0.11	0.10	0.66	0.13	0.84	0.16	Rim adjacent to garnet	0.47	0.53	0.00
			X_{Fe}		garnet rim	0.11	0.10	0.66	0.13	0.84	0.16				
Lac Audréa	S-218	Prograde conditions crossing reaction [R1]	GASP	P1	Grs enriched zone	0.06	0.00	0.56	0.38	0.59	0.41	Most An rich core	0.84	0.15	0.01
			X_{Fe}		Grs enriched zone	0.06	0.00	0.56	0.38	0.59	0.41				
		Melt crystallization	GASP	R1	garnet rim	0.03	0.01	0.60	0.36	0.62	0.38	Rim closest to garnet	0.87	0.12	0.01
			X_{Fe}			0.03	0.01	0.60	0.36	0.62	0.38				