CHAPTER-5

MINERALOGY

5.1 Introduction

This chapter presents the mineral chemistry of mafic granulites and pelitic granulites. An endeavour has been undertaken to decipher the historical development of granulites in the designated region, since they offer significant insights into comprehending the intricate processes occurring in the deep crust. The mafic and pelitic granulite from Betul Belt of the Central Indian Tectonic Zone (CITZ) show diverse mineral assemblages, which are obtained from their detailed petrographic studies (see chapter 4).

Electron microprobe analyses (EPMA) of various silicate minerals have been carried out for selected rock samples of the study area. Wherever possible, an attempt has been made to correlate mineral chemistry with the host rock's bulk composition. Special attention has been paid to record any chemical zoning present in the minerals during the electron microprobe analyses. The EPMA has been carried out for fresh minerals (avoiding altered minerals). The emphasis has been given to analyses of coexisting mineral phases suitable for geothermometry (models applicable to; garnet-clinopyroxene, garnet-orthopyroxene, clinopyroxene-orthopyroxene, garnet-cordierite, garnet-biotite) and geobarometry (garnet-cordierite-sillimanite-quartz and garnet-clinopyroxene plagioclase- quartz). Geothermometers are generally based on cations' exchange, especially Fe-Mg between the coexisting minerals. Therefore, geothermometers are sensitive to Fe-Mg re-equilibrations and often calculate temperature at the time of crystallization of mineral.

On the other hand, geobarometers rely mostly on the net transfer reactions, especially at high temperatures and are less sensitive to late ion re-equilibrations. [280] have demonstrated that more accurate and realistic peak temperatures-pressures could be estimated by studying relict mineral assemblages in rock types. The analyzed sample's location is shown in the geological map of the area (Fig.3.3). Prior to the discussion of mineralogy, the analytical method used to analyses the rocks and the minerals are discussed below.

5.2 EPMA analytical technique

The analytical investigation was conducted using the EPMA (CAMECA SX Five) equipment located at the DST–SERB National Facility, Department of Geology, Centre of Advanced investigation, Institute of Science, Banaras Hindu University. The LEICA-EM ACE200 device was utilised to apply a 20 nm carbon coating onto a refined thin section. The CAMECA SX Five instrument was utilised with a voltage of 15 kV and a current of 10 nA. The electron beam generation was achieved using a LaB_6 source in the electron gun. In this study, the mineral andradite, which is a natural silicate, was employed as an internal standard to validate the crystal positions (SP1-TAP, SP2-LiF, SP3-LPET, SP4-TAP, and SP5-PC1) with respect to the corresponding wavelength dispersive (WD) spectrometers (SP#) in the CAMECA SX Five instrument. The analyses involved the use of the following X-ray lines: F-Kα, Na-Kα, Mg-Kα, Al-Kα, Si-Kα, P-Kα, K-Kα, Cl-Kα, Ca-Kα, Ti-Kα, Cr-Kα, Mn-Kα, Fe-Kα, Ni-Kα, and Sr-Lα. For regular calibration and quantification, a selection of natural mineral standards including apatite, albite, halite, periclase, peridotite, corundum, wollastonite, orthoclase, rutile, chromite, rhodonite, celestite, barite, hematite, as well as synthetic Ni metal provided by CAMECA AMETEK were utilised. The calibration, acquisition, quantification, and data processing procedures were conducted using SxSAB version

6.1 and SX-Results software developed by CAMECA. The representative EPMA data of different minerals are presented in **Tables 5.1–5.11.**

5.3 Garnet

Garnet constitutes the leading mineral group in the metamorphic rocks, which is essential to interpret the metamorphic rocks' genesis. Garnet from different rock types essentially consists of a solid solution of almandine, pyrope, grossularite, and spessartine end members. Garnets have proved a wide range in chemical composition which depends on the mineral assemblage, bulk rock chemistry and metamorphic condition. The microprobe analyses and the structural formulae based on 12 oxygen atom of garnet from the high-grade gneiss, pelitic granulite and mafic granulite are presented in **Table 5.1 and 5.2**.

The garnets' stoichiometry corresponds closely to the ideal formula: $(Fe^{2+},Mg, Mn, Ca)_3 (Al, Ti, Cr, Fe^{3+})_2 Si_3O_{12}$, there is a minor deficiency in the sum of the divalent cations. The structural formulae of the garnet are $X_3Y_2Z_3O_{12}$ (on 12 oxygen basis), where, X is an 8 coordinated site that includes $(Fe^{2+}, Mn, Mg, Ca)_3$, Y is a 6-coordinated site that includes $(Al, Ti, Cr, Fe^{3+})2$ and Z is a tetrahedral site that generally includes (Si_3O_{12}). The garnets consist of 37.13 to 79.39 mole % almandine, 12.74 to 22.44 mole % pyrope, 0.31 to 15.96 mole%, grossularite and 0.91 to 28.72 mole% spessartite end members in the studied rocks. Pyrope contents of garnet in peltic granulites is more than the mafic granulites. Whereas the grossularite contents of garnet in mafic rocks is more than the pelitic granulites. The analyzed garnets are plotted in (Ca+Mn)–Mg–Fe^{2+} diagram (Fig.5.1a). All the garnet plots from the high-grade gneisses and pelitic granulites fall in the almandine- pyrope region, whereas the plot of the garnets from the mafic granulites shows higher contents of grossularite- spessartite. The Mn-rich garnets are described mostly from the hornfels [281] with MnO content of up to 12 wt%. The X_{Mg} in the garnets from Betul belt varies from 0.23–0.31. This range may be attributed to Mn or Ca, which occupy the eight-fold coordination site in the garnet's crystal structure. The X_{Mg} vs Ca/Mn plots do not show any distinct correlation (Fig.5.1b).

5.4 Amphibole

The word “amphibole” is derived from a Greek word introduced by [286], which means an allusion of the mineral having various composition and appearance. The amphibole and

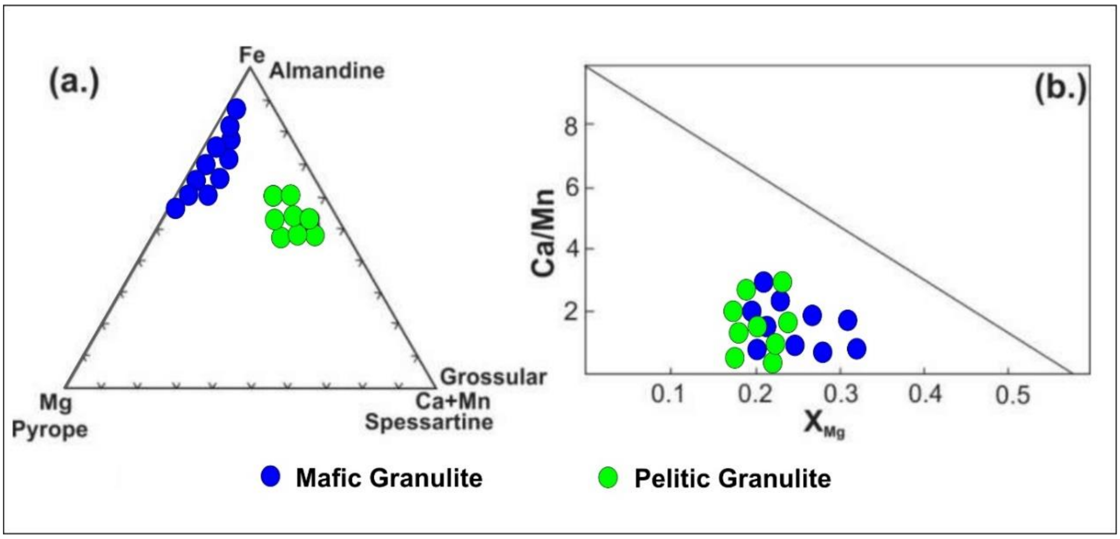

Figure 5.1(a) Triangular diagram showing the variation in (spessartine + grossular)–almandine–pyrope end member compositions in the garnets from different rock types. (b) A plot of X_{Mg} vs Ca/Mn of garnets, from different rock types.

pyroxene groups of minerals are chain silicates, the initial work of which was described by [287]. In 1961 Schaller, recognized the essential constituents of amphibole group mineral, making it different from pyroxene in an abundance of hydroxyl ions.

Amphibole is made up of $(Si,Al)O_4$ tetrahedral silicate linked to form a double chain and has a unit composition of Si_4O_{11}. The double chain silicates have two tetrahedral which lie at the inner and outer part of each chain T1 and T2 respectively, which repeated along C-axis of an unit cell at an interval of approximately 5.3Å. A hexagonal shape space is formed through double chain silicate, which is usually linked by hydroxyl ion.

The general formula of amphibole is $\mathbf{A_{0-1}B_2C_5T_8O_{22}(OH,F)_2}$; where, **A-site** is for large cation Na, K; **B-site** for the cation at M4 site Ca, Na; **C-site** for cation at M1, M2, M3 (usually medium size cation) sites; **T-site** those in tetrahedral T1 and T2 coordinated by O_3 (OH) in an octahedral manner.

5.4.1 Classification of amphibole

The group and nomenclature of amphiboles mafic granulites have been assigned based on Ca+Na vs Na diagram [288] that suggest calcic amphibole (hornblende) present in mafic granulites.

5.4.2 Hornblende

The microprobe analyses of hornblende from mafic granulites are presented in **Table 5.3** along with their structural formula calculated based on 23 oxygen atoms. The structural formulae of the analyzed hornblende correspond to the general formula of calcic amphibole $[(Ca, Na, K)_{2-3}(Mg, Fe, Cr, Mn, Al^{VI}, Ti)_5 (Si, Al^{IV})_8 O_{22} (OH)_2]$.

The Alumina content of hornblende is dependent on (a) host rock composition particularly $Al_2O_3/(Al_2O_3 + SiO_2)$ ratio (b) PT conditions [289] proposed that the Al^{IV}content of hornblende increases with pressure, the hornblende from magmatic and contact metamorphic rocks generally have lower Al^{VI} and Si contents than hornblende in regionally metamorphosed rocks. The presence of two generations of hornblende in mafic granulites is evident from the mineral chemistry data collected using electron probe microanalysis (EPMA). The magnesium (Mg) content of Hbl1 varies between

2.00 and 2.03 per formula unit (pfu) in its central region, and it is involved in the prograde metamorphic reaction. The core region of Hbl2 exhibits a magnesium (Mg) content ranging from 1.92 to 1.94 per formula unit (pfu) and possesses retrograde characteristics. The hornblende mineral has a range of aluminium (Al) concentration, with values ranging from 1.85 to 2.05 per formula unit (pfu), as determined by the structural formula derived based on a 23 oxygen basis. The magnesium content of hornblende exhibits a range of values, specifically ranging from 0.42 to 0.46. The titanium (Ti) concentration of hornblende exhibits a range of values, spanning from 0.24 to 0.31 per formula unit (pfu). Similarly, the weight percentage (wt%) of titanium dioxide (TiO2) in hornblende ranges from 2.12 to 2.75. Hornblende exhibits a calcic character, as indicated by its elevated calcium content, which ranges from 1.87 to 1.98 parts per formula unit (pfu).

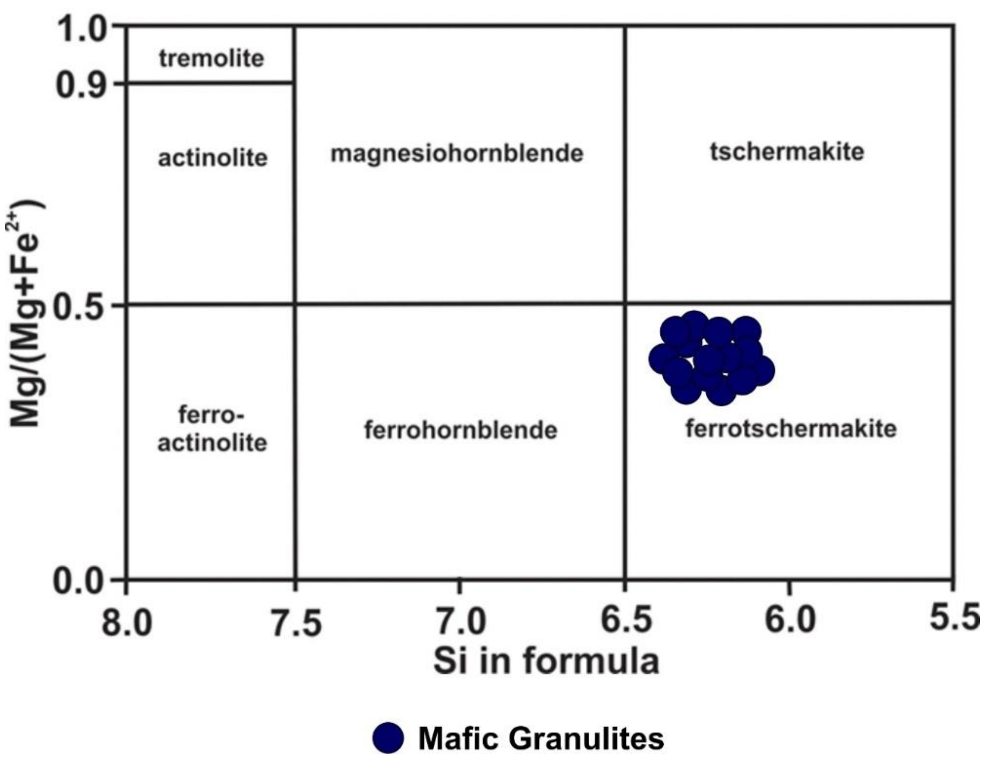

Fig 5.2. Leake's classification for representation of the EPMA data of amphibole for mafic granulites

5.5 Pyroxene

The name pyroxene is derived from the Greek world, which was first introduced by [286]. Pyroxene is a combination of two words: which mean *pyro-fire* and *xenos-stranger*. It is an anhydrous single-chain silicate mineral found in both igneous and metamorphic rock. Four components: $CaMgSi_2O_6$-$CaFeSi_2O_6$-$Mg_2Si_2O_6$-$Fe_2Si_2O_6$ (Diopside-Hedenbergite Enstatite-Ferrosilite) based nomenclatures of pyroxenes were first described by [293]. Later, IMA/CNMMN (International Mineralogical Association/ Commission on New Minerals and Mineral Names; [294] and references therein) provided a series of recommendations and schemes for the classification nomenclature of pyroxenes. This nomenclature was later modified by [295]. The first pyroxene (diopside) structure was determined by [296]. They established that the pyroxene structure is linked by SiO_4 tetrahedral by sharing two oxygen atoms out of four by each tetrahedron, forming a single chain structure. Cations laterally surround this chain in M1 and M2 sites. M1 site atom lies between the apices and M2 site at the base of SiO_3 tetrahedral chain. Further pyroxene can be sub-grouped based on cation participation in M1 and M2 sites, mostly depending on variable parameters such as P and T. The co-ordination of oxygen at M1 site is fixed, i.e. octahedral whereas at M2 site, it is variable according to the cation size, for instance, Mg in six-fold coordination; eight fold coordination for Na- Ca. The microprobe analysis and structural formulae (calculated based on 6 oxygen) of orthopyroxene and clinopyroxene are presented in **Tables 5.4 to 5.6**, respectively. The recalculated formulae approximate to the ideal formula: $[(Mg, Fe^{2+}, Al, Ti, Mn, Ca)_2 (Si, Al)_2 O_6]$.

5.5.1 Orthopyroxene

The electron probe microanalysis (EPMA) results for pyroxene were graphed on a triangular diagram representing the end-member compositions of $CaSiO_3$, $MgSiO_3$, and $Fe^{2+}SiO_3$ (see Figure 5.3). The orthopyroxene diagram for mafic and pelitic granulites is situated at $En_{29–50}$ in close proximity to hypersthene, which represents the compositional range between the magnesium (Mg) and iron (Fe) end-members of orthopyroxene (X_{Mg} = 0.29–0.50). Additionally, the aluminium (Al) content of the orthopyroxene ranges from 0.04 to 0.08 per formula unit (pfu), based on a six-oxygen basis. An essential feature of orthopyroxene chemistry is the Al content this may be dependent on several factors: (a) Host rock composition, (b) the composition of the coexisting mineral [297-299], (c) the pressure-temperature conditions of formation [300]. The X_{Mg} ranges between 0.29 and 0.50 and corresponds to hypersthene. The Ca content of orthopyroxene (0.02 to 0.04 p.f.u) based on 6 oxygen, is lower than the cpx.

5.5.2 Clinopyroxene

The coexisting clinopyroxene plot in a triangular end member $CaSiO_3$–$MgSiO_3$ –$Fe^{2+}SiO_3$ diagram lies in the field of augite and diopside. The X_{Mg} of clinopyroxene ranges between 0.59 and 0.65. It has higher X_{Mg} and Al-content compared to orthopyroxene. Ca-content of the clinopyroxene varies between (0.812 to 0.929 p.f.u) suggest the evidence of high content of Ca in clinopyroxene, which is a characteristic of mafic granulite assemblages. The Al_2O_3 content in clinopyroxene varies between 1.86 to 3.91 wt%. The higher amounts of Al_2O_3 present reflect an increasing Jadeite component, indicating higher pressures attained during metamorphism.

5.6 Cordierite

Cordierite is a cyclo-silicate composed of magnesium, iron, and aluminium, which is commonly found in argillaceous rocks that have undergone contact or regional metamorphism. The stoichiometry approximates to the ideal formula: [(Mg, $Fe^{2+})_2$ $(Al_4Si_5O_{18})nH_2O$]. Iron in the cordierite is almost always present, and a solid solution exists between Mg-rich and Fe-rich cordierite. Cordierite structure accommodates molecular water with values of n commonly between 0.15 and 0.80 [301]. The cordierite analyses show summation between 94.035 to 99.053 wt%, suggesting that it may be hydrous containing 0.947–5.965 wt% H_2O and gaseous species as cordierite contains a large channel site at the center of its six-members ring structure that can accommodate molecular H_2O, CO_2 and to a lesser extent other volatile species such as CH_4, N_2 and Ar [302-307]. It is now well accepted that cordierite's molecular water content is a function of P and T [308-310]. The analyses of cordierite with their structural formulae based on 18 Oxygen from pelitic granulite are listed in **Table 5.7**.

The X_{Mg} varies between 0.61 and 0.68 which correspond to the cordierite from pelitic granulites. The microprobe studies of the cordierite indicate no zoning, reflecting variable dominance of the effect of small-scale cation exchange with inclusion, diffusion and continuous re-equilibration with matrix grains following nucleation. Insignificant amounts of Na_2O and K_2O are commonly present, range from 0.01 to 0.18 wt% and 0.01 to 0.05 wt%, respectively. [311] suggested that K contents increases with temperature and decreases with water content. Thus, it can be inferred that water content in cordierite will below based on the depletion of K in cordierite.

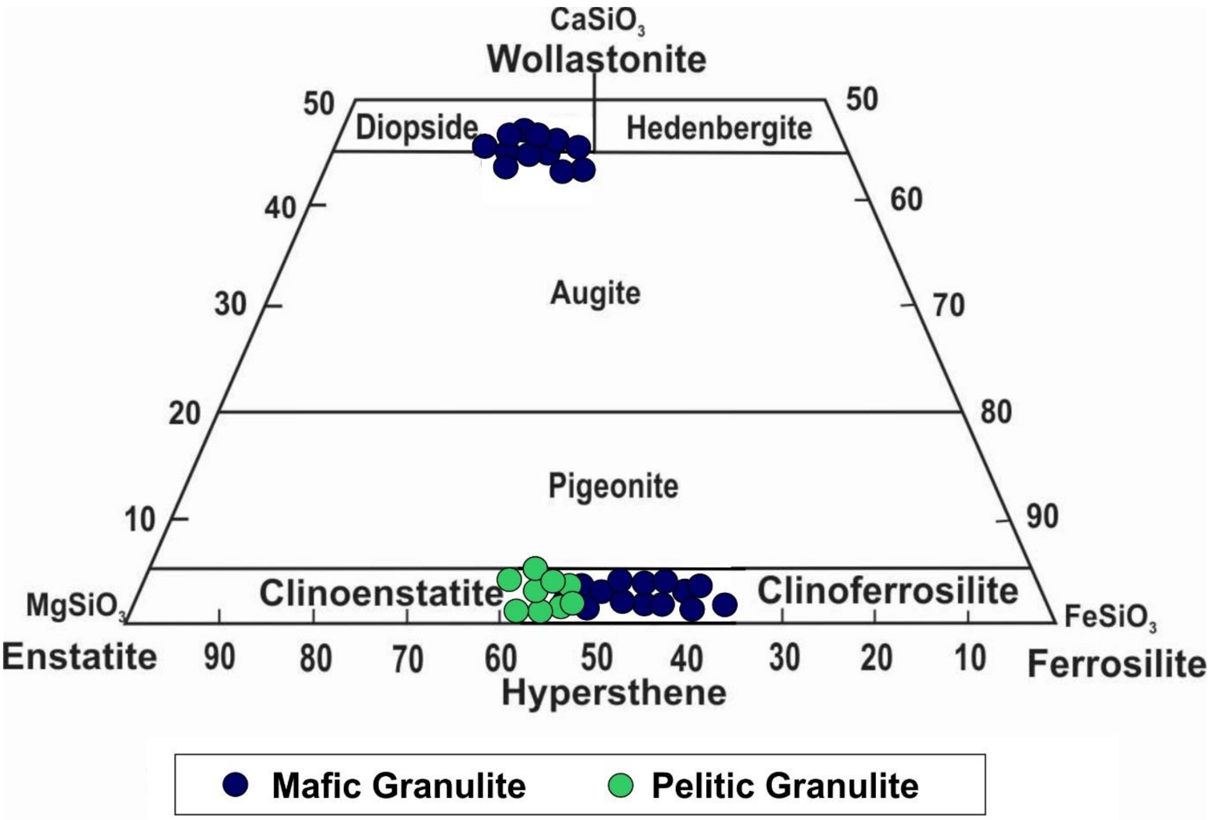

Fig 5.3 Representation of EPMA data of pyroxene shown in pyroxene quadrilateral (part of the triangular diagram CaSiO3–MgSiO3–FeSiO3). The clinopyroxene coexisting with orthopyroxene is joined by a line.

5.7 Mica

The mica minerals belong to phyllosilicate commonly found in igneous, metamorphic and sedimentary rocks. It is mainly composed of two sheets silica tetrahedral between which octahedral coordinated cation exists. Additional OH– (hydroxyl ion) is associated and completes the sandwiched octahedral cations. These octahedral cations coordination are either in the form of brucite layer $Mg_3(OH)_6$ or in gibbsite layer $Al_2(OH)_6$. The general chemical formula of micas is $X_2Y_{4-6}Z_8O_{20}(OH,F)_4$ where; X is for K, Na, Ca, Ba, Rb, Cs; Y is for Al, Mg or Fe, Mn, Cr, Li and Z is for Si or Al but also for Fe^{3+} and Ti^{4+}.

The Mica group is further subdivided based on several Y ions present is 4 and 6 dioctahedral (muscovite) and tri-octahedral (biotite) classes. However, mica can be sub classified as common mica in which K or Na are dominant ions in X, whereas if Ca ion is present, then it is known as brittle mica. In trioctahedral mica, the number of Y ions equals 3 atoms. Depending upon prevailing Physico-chemical conditions and nature of melt, sometimes K in the X site may be replaced by Ba, Rb or Cs and, therefore, a total sum of X site in the formula may be more than unity.

5.7.1 Biotite

The analytical electron microprobe data of biotite from mafic granulites and pelitic granulites, with their structural formula (calculated on the basis of 22 oxygen) are presented in (**Table 5.8 and 5.9**). The structural formula approximated to the ideal formula of biotite: $[(K,Na,Ca)\ (Al^{VI}, Mg, Fe, Mn, Ti)_3\ (Si, Al^{IV})_4\ O_{10}\ (OH)_2]_2$.

The biotite exhibits composition between the end members annite $[K_2Fe_6(Si_6Al_2O_{20})(OH)_4]$, siderophyllite $[K_2Fe_5Al(Si_5Al_3O_{20})(OH)_4]$, phlogopite $K_2Mg_6(Si_6Al_2O_{20})(OH)_4]$, eastonite $[K_2Mg_5Al(Si_5Al_3O_{20})(OH)_4]$. The biotites' analyses display a narrow range of X_{Mg} (0.39 to 0.61). The X_{mg} in mafic granulites range between 0.39 and 0.47 whereas the Xmg values for pelitic granulites range between 0.45 and 0.61. The Al^{IV} content of all studied rock samples varies from 2.308 to 2.525 p.f.u.

5.7.1.1 TiO_2 content

TiO_2 content of biotite is very significant in estimating the rock's metamorphic grade [312-314]. In the Betul Belt's analyzed biotites, the amount of TiO_2 in biotite from the mafic granulite is higher than pelitic granulite. TiO_2 contents of biotite from mafic granulites range from 3.46–4.26 wt% and in pelitic granulites 0.85–1.31 wt%.

The plots of Ti vs Mg (Fig.5.5c) and Ti vs X_{Fe}/X_{Mg} (Fig.5.5d) show a negative and linear correlation, respectively.

5.8 Feldspar

The original name of feldspar was feldtspat which refers to the presence of the spar (spath) in tilled field (Swedish; feldt or falt) overlying granite, rather than German 'Fels' meaning rock. The feldspar group of minerals is ubiquitous in most of the studied lithounits. Indeed feldspar is termed as quaternary feldspar because of inclusion of celsian (Ba-feldspar) in additional to common end-members orthoclase (Or)-albite (Ab)- anorthite (An). Feldspars can be considered as two distinct binary solutions: the alkali feldspars $NaAlSi_3O_8$–$KAlSi_3O_8$ (albite-orthoclase) and the plagioclase feldspars $NaAlSi_3O_8$–$CaAl_2Si_2O_8$ (albite-anorthite). Feldspars from different rock types are plotted in the triangular $NaAlSi_3O_8$–$KAlSi_3O_8$–$CaAl_2Si_2O_8$ diagram (Fig.5.5). Table 5.10 displays the representative microprobe analyses and structural formulae of plagioclase and K-feldspar, which have been derived based on 32 Oxygen. Based on the EPMA data and the derived structural formula, it can be inferred that the observed plagioclase is of the labradorite variety, characterised by a higher calcium content relative to potassium. The An-content of plagioclase minerals varies between An50 and An76, as determined through the application of the Ca/(Ca + Na + K) ratio. The plagioclase exhibits no zoning. The recalculation of the general formula of plagioclase $(Ca, Na, K)_2(Al, Si)_8O_{16}$ show a persistent deficiency of larger cations. They suggested that the deficiency may be explained through deviation from ideal plagioclase stoichiometry towards a higher siliceous solid solution, for example, in pure albite virtue of substitution Si = Na, Al, and in anorthite through Si = Al, 0.5Ca. Plagioclase contains minor amounts of total iron as FeO.

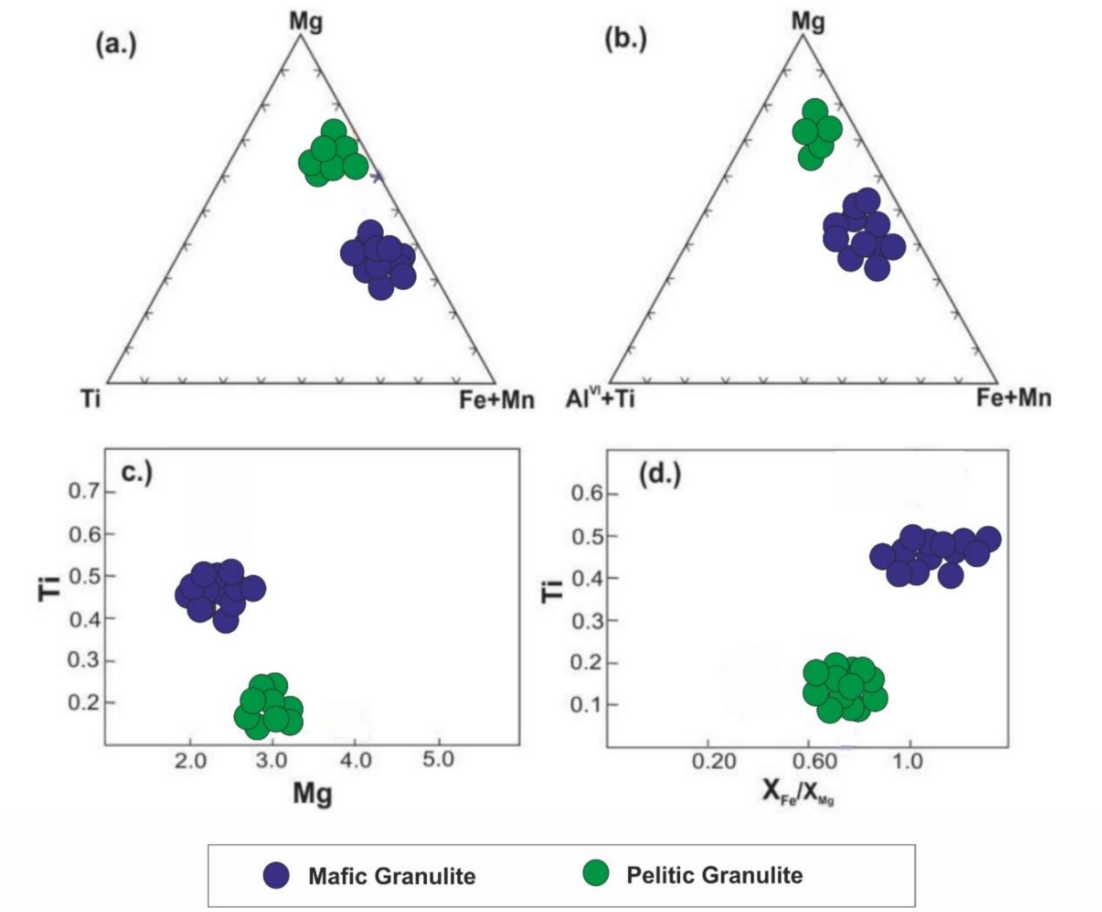

Figure 5.4 (a) A plot of microprobe analyses of biotites from mafic granulites in Mg- Ti (Fe+Mn) diagram. (b) A plot of microprobe analyses of biotites from different rock type in Mg-(Al^{IV}+Ti) - (Fe+Mn) diagram. (c) A plot of Ti vs Mg showing negative trend. (d) A plot of X_{Fe}/X_{Mg} vs TiO_2 showing linear relationship.

In the feldspar, smaller six co-ordinate divalent cations are not possible on crystal structure ground. Fe is likely present as Fe^{3+} substituting Al^{3+} or possibly due to extremely fine inclusion of opaque in plagioclase which could not be identified under microprobe.

5.9 Sillimanite

The electron microprobe data of the sillimanite and their structural formulae (calculated on the basis of 10 Oxygen) from pelitic granulites is presented in Table 5.11. The composition is relatively pure Al_2SiO_5. The most common ion replacing aluminium in the sillimanite structure is ferric ion while other elements viz. Ti, Cr, Ca, K, Na and

Mn are present in minimum amounts. The Al-content ranges between 3.865–3.953 p.f.u. Sillimanite includes minor amounts of Cr and Fe. Total Fe as Fe^{2+} has been analysed. The Cr and Fe content varies from 0.001 to 0.002 p.f.u and 0.019 to 0.029 p.f.u, respectively.

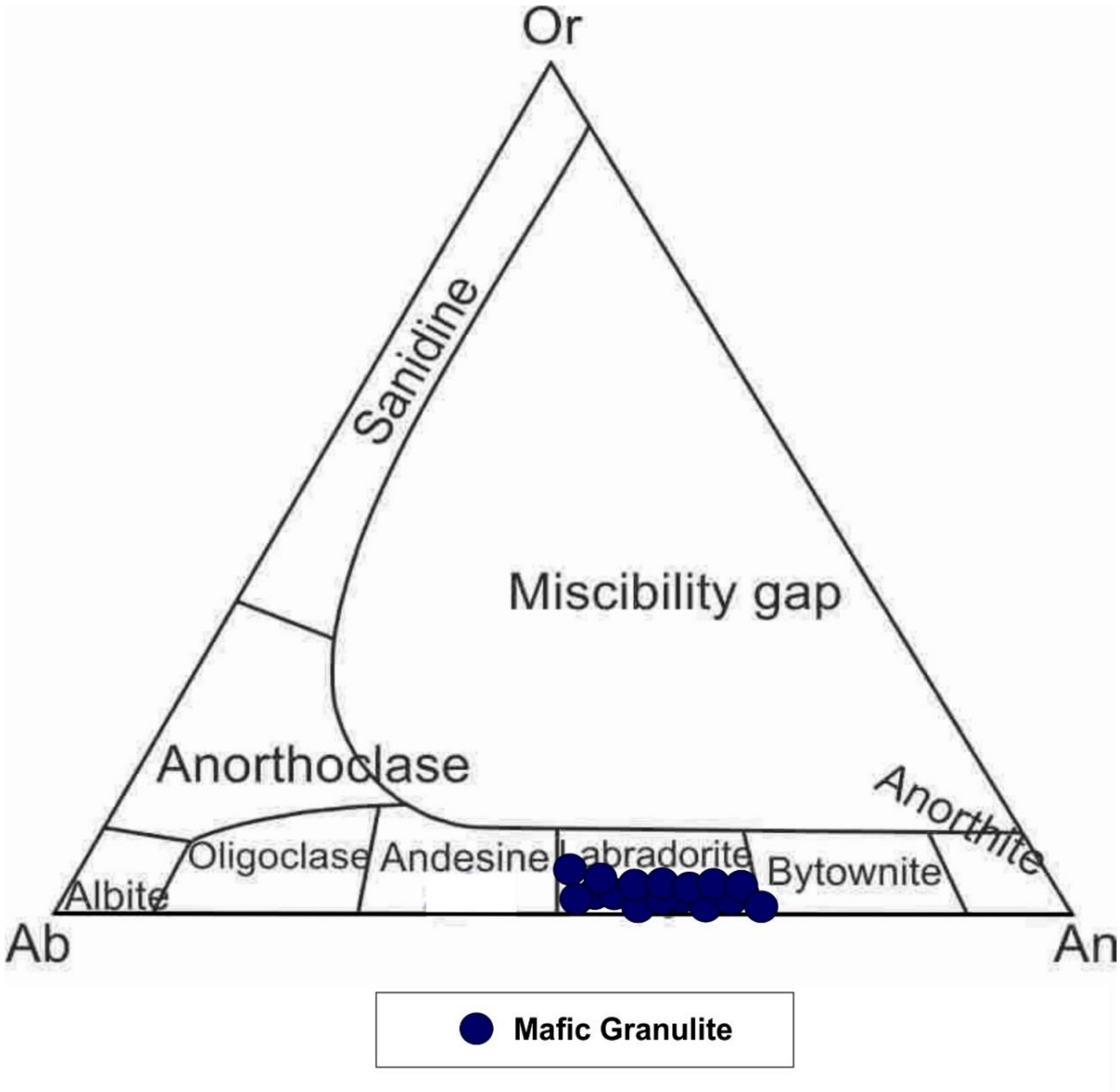

Figure 5.5 Triangular $NaAlSi_3O_8$–$KalSi_3O_8$–$CaAl_2Si_2O_8$ diagram showing plots of alkali feldspar and Plagioclase feldspar.

Table 5.1 Chemical analysis and structural formulae (on the basis of 12 Oxygen) of garnet from Mafic Granulites.

Sample					**N-14**					
Domain	**12 / 1.**	**13 / 1.**	**14 / 1.**	**17 / 1.**	**18 / 1.**	**19 / 1.**	**20 / 1.**	**21 / 1.**	**22 / 1.**	**32 / 1 .**
SiO_2	36.78	35.77	37.77	37.21	37.99	37.25	37.41	37.96	38.83	37.73
TiO_2	0.05	0.04	0.03	0.03	0.03	0.02	0.04	0.03	0.03	0.03
Al_2O_3	20.96	20.13	20.83	20.79	21.11	20.54	20.79	20.26	20.65	20.88
FeO	20.71	20.65	20.49	20.55	20.16	20.29	20.19	20.33	19.98	19.93
MnO	10.63	10.82	11.18	11.63	11.49	11.93	11.87	10.96	11.59	11.71
MgO	4.33	4.50	3.13	4.21	3.97	3.83	3.57	3.99	3.76	3.54
CaO	6.73	6.96	6.99	6.71	6.59	6.49	6.51	6.29	6.37	6.59
Total	**100.19**	**98.87**	**100.42**	**101.13**	**101.34**	**100.35**	**100.38**	**99.82**	**101.21**	**100.41**
Si	2.929	2.904	2.998	2.943	2.981	2.968	2.976	3.021	3.042	2.992
Ti	0.003	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002
Al	1.968	1.927	1.949	1.938	1.953	1.929	1.949	1.901	1.907	1.951
Fe^{3+}	0.100	0.167	0.051	0.117	0.064	0.101	0.073	0.076	0.049	0.055
Fe^{2+}	1.279	1.236	1.309	1.242	1.259	1.251	1.270	1.278	1.260	1.266
Mn	0.717	0.744	0.752	0.779	0.764	0.805	0.800	0.739	0.769	0.786
Mg	0.514	0.545	0.370	0.496	0.464	0.455	0.423	0.473	0.439	0.418
Ca	0.574	0.606	0.595	0.569	0.554	0.554	0.555	0.536	0.535	0.560
Tot. cation	8.084	8.130	8.026	8.086	8.041	8.066	8.048	8.026	8.003	8.031
X_{Mg}	0.29	0.31	0.22	0.29	0.27	0.27	0.25	0.27	0.26	0.25
Almandine	41.47	39.48	43.27	40.25	41.39	40.82	41.67	42.21	41.96	41.78
Spessertine	23.25	23.78	24.85	25.25	25.12	26.27	26.24	24.42	25.61	25.95
Pyrope	16.66	17.40	12.24	16.08	15.27	14.84	13.89	15.64	14.62	13.80
Grossularite	14.53	13.31	17.26	13.83	15.36	13.98	15.02	14.41	15.48	15.96
Andradite	4.09	6.04	2.39	4.60	2.87	4.10	3.18	3.32	2.33	2.52

$X_{mg} = Mg^{2+}/(Fe^{2+} + Mg^{2+})$

Table 5.1 contd.

Sample	BG-04									
Domain	**33 / 1.**	**34 / 1.**	**35 / 1.**	**36 / 1.**	**51/1.**	**52/1.**	**53/1.**	**54/1.**	**115 / 1.**	**116 / 1.**
SiO_2	37.87	35.93	35.81	35.66	35.75	35.28	37.24	38.82	36.53	36.79
TiO_2	0.03	0.03	0.03	0.02	0.01	0.03	0.02	0.01	0.03	0.04
Al_2O_3	20.19	21.13	21.66	20.99	21.42	20.93	21.17	20.73	19.96	19.99
FeO	19.67	20.82	19.86	19.96	19.53	18.79	17.82	18.27	20.09	20.46
MnO	12.29	11.99	11.13	12.51	12.69	13.01	12.57	12.30	11.83	11.65
MgO	3.65	3.29	3.79	4.13	4.25	4.12	4.33	4.51	4.06	3.75
CaO	6.83	6.75	6.73	6.15	6.97	6.50	6.28	6.13	6.27	6.38
Total	**100.53**	**99.95**	**100.67**	**99.42**	**100.62**	**98.66**	**99.43**	**100.77**	**98.77**	**99.06**
Si	3.008	2.894	2.887	2.882	2.855	2.871	2.966	3.039	2.962	2.975
Ti	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.002	0.002
Al	1.890	2.006	2.058	1.999	2.016	2.008	1.987	1.913	1.908	1.906
Fe^{3+}	0.101	0.098	0.053	0.118	0.128	0.119	0.046	0.048	0.128	0.117
Fe^{2+}	1.206	1.305	1.286	1.231	1.176	1.160	1.141	1.148	1.234	1.267
Mn	0.827	0.818	0.760	0.856	0.858	0.897	0.848	0.816	0.813	0.798
Mg	0.432	0.395	0.455	0.497	0.506	0.500	0.514	0.526	0.491	0.452
Ca	0.581	0.583	0.581	0.532	0.596	0.567	0.536	0.514	0.545	0.553
Tot. cation	8.046	8.101	8.082	8.117	8.136	8.123	8.039	8.004	8.082	8.070
X_{Mg}	0.26	0.23	0.26	0.29	0.30	0.30	0.31	0.31	0.28	0.26
Almandine	39.59	42.09	41.71	39.49	37.49	37.13	37.55	38.22	40.04	41.27
Spessertine	27.15	26.38	24.66	27.47	27.37	28.72	27.90	27.15	26.36	26.00
Pyrope	14.18	12.74	14.77	15.95	16.13	16.00	16.91	17.51	15.92	14.72
Grossularite	14.87	14.86	16.51	12.66	14.23	13.62	15.56	14.91	12.76	13.37
Andradite	4.22	3.93	2.35	4.42	4.79	4.53	2.08	2.20	4.92	4.64

$X_{mg} = Mg^{2+}/(Fe^{2+} + Mg^{2+})$

Table 5.2 Chemical analysis and structural formulae (on the basis of 12 Oxygen) of garnet from Pelitic Granulites.

Sample								**BK-5**						
Domain	**117 / 1.**	**118 / 1.**	**119 / 1.**	**120 / 1.**	**121 / 1.**	**122 / 1.**	**123 / 1.**	**124 / 1.**	**130 / 1.**	**131 / 1.**	**132 / 1.**	**133 / 1.**	**134 / 1.**	**138 / 1.**
SiO_2	37.29	37.51	37.69	38.19	38.97	37.77	37.29	37.97	38.13	38.79	37.99	37.57	37.39	38.52
TiO_2	0.04	0.02	0.01	0.03	0.03	0.06	0.08	0.01	0.01	0.06	0.04	0.06	0.02	0.02
Al_2O_3	20.06	20.33	20.71	20.44	20.23	19.99	19.79	21.23	20.51	20.09	20.15	20.53	20.83	20.72
FeO	36.25	36.87	35.69	34.87	35.29	36.87	36.91	35.99	35.54	33.63	34.27	35.86	34.69	34.83
MnO	0.59	0.41	0.46	0.53	0.39	0.62	0.59	0.67	0.53	0.49	0.66	0.67	0.55	0.48
MgO	4.29	4.89	5.03	5.61	5.29	5.63	4.98	4.63	5.55	5.27	5.66	4.93	4.85	4.26
CaO	0.73	0.69	0.82	0.79	0.66	0.61	0.59	0.85	1.09	0.58	0.62	0.69	0.62	0.89
Total	**99.25**	**100.72**	**100.41**	**100.46**	**100.86**	**100.55**	**100.23**	**100.35**	**100.36**	**98.91**	**99.39**	**100.31**	**98.95**	**99.72**
Si	3.021	2.997	3.003	3.027	3.073	2.994	3.001	2.998	3.007	3.099	3.039	3.002	3.011	3.071
Ti	0.002	0.001	0.001	0.002	0.002	0.004	0.005	0.001	0.001	0.004	0.002	0.004	0.001	0.001
Al	1.916	1.914	1.945	1.910	1.880	1.868	1.877	1.976	1.907	1.892	1.900	1.934	1.977	1.947
Fe^{3+}	0.060	0.088	0.052	0.061	0.045	0.135	0.117	0.025	0.085	0.006	0.058	0.061	0.010	0.000
Fe^{2+}	2.396	2.376	2.326	2.251	2.282	2.310	2.367	2.352	2.259	2.241	2.235	2.336	2.326	2.322
Mn	0.040	0.028	0.031	0.036	0.026	0.042	0.040	0.045	0.035	0.033	0.045	0.045	0.038	0.032
Mg	0.518	0.582	0.597	0.663	0.622	0.665	0.597	0.545	0.652	0.627	0.675	0.587	0.582	0.506
Ca	0.063	0.059	0.070	0.067	0.056	0.052	0.051	0.072	0.092	0.050	0.053	0.059	0.054	0.076
Tot. cation	8.018	8.045	8.024	8.016	7.985	8.068	8.056	8.013	8.039	7.952	8.008	8.027	7.999	7.955
X_{Mg}	0.18	0.20	0.20	0.23	0.21	0.22	0.20	0.19	0.22	0.22	0.23	0.20	0.20	0.18
Almandine	79.39	78.03	76.91	74.62	76.44	75.28	77.47	78.04	74.34	75.94	74.31	77.16	77.56	79.07
Spessertine	1.34	0.91	1.03	1.18	0.87	1.36	1.32	1.49	1.17	1.12	1.49	1.50	1.25	1.10
Pyrope	17.16	19.12	19.75	21.97	20.82	21.68	19.55	18.08	21.47	21.26	22.44	19.39	19.41	17.23
Grossularite	0.82	0.57	1.07	0.90	0.80	0.31	0.34	1.54	1.22	1.30	0.63	0.72	1.34	2.53
Andradite	1.28	1.37	1.25	1.33	1.07	1.37	1.33	0.84	1.81	0.38	1.13	1.23	0.44	0.06

$X_{mg} = Mg^{2+}/(Fe^{2+} + Mg^{2+})$

Table 5.3 Chemical analysis and structural formulae (on the basis of 23 Oxygen) of Hornblende from mafic granulite.

Sample no.	CH-03									
Domain	92 / 1.	167 / 1.	94 / 1.	95 / 1.	108 / 1.	134 / 1.	110 / 1.	111 / 1.	112 / 1.	113 / 1.
SiO_2	40.21	41.15	40.38	41.12	40.27	41.31	40.75	40.74	40.78	40.60
TiO_2	2.28	2.76	2.43	1.79	2.20	2.30	2.39	2.33	2.17	2.28
Al_2O_3	10.80	10.23	10.87	10.95	10.74	10.71	10.71	10.69	10.73	10.81
Cr_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FeO	18.64	19.33	18.48	17.88	19.46	18.32	18.51	18.71	18.61	19.23
MnO	0.13	0.20	0.22	0.20	0.28	0.29	0.27	0.00	0.24	0.10
MgO	8.77	9.01	8.48	8.65	8.23	9.06	8.72	8.69	8.50	8.14
CaO	11.70	11.78	11.92	11.79	11.79	11.32	11.43	11.55	11.55	11.66
Na_2O	1.27	1.22	1.33	1.22	1.19	1.17	1.21	1.29	1.25	1.13
K_2O	1.68	1.71	1.78	1.53	1.80	1.77	1.84	1.86	1.65	1.78
ZrO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**96.33**	**97.97**	**96.48**	**96.01**	**96.58**	**96.87**	**96.50**	**96.42**	**96.07**	**96.32**
Si	6.311	6.344	6.313	6.430	6.321	6.399	6.361	6.362	6.386	6.363
Ti	0.269	0.320	0.286	0.211	0.260	0.268	0.280	0.273	0.256	0.269
Al	1.997	1.858	2.003	2.018	1.986	1.956	1.971	1.966	1.980	1.996
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe^{2+}	2.447	2.492	2.415	2.338	2.554	2.373	2.417	2.444	2.436	2.520
Mn	0.018	0.026	0.029	0.026	0.037	0.038	0.035	0.000	0.032	0.013
Mg	2.053	2.071	1.976	2.017	1.927	2.092	2.031	2.023	1.984	1.901
Ca	1.967	1.945	1.997	1.974	1.982	1.878	1.912	1.933	1.938	1.958
Na	0.386	0.365	0.403	0.371	0.361	0.352	0.366	0.391	0.381	0.342
K	0.335	0.336	0.356	0.304	0.361	0.350	0.367	0.370	0.330	0.357
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	15.78	15.76	15.78	15.69	15.79	15.71	15.74	15.76	15.72	15.72
X_{mg}	0.46	0.45	0.45	0.46	0.43	0.47	0.46	0.45	0.45	0.43

$X_{mg} = Mg^{2+}/(Fe^{2+} + Mg^{2+})$

Table 5.3 contd.

Sample no.	CH-04									
Domain	52 / 1.	14 / 1.	15 / 1.	49 / 1.	50 / 1.	51 / 1.	28 / 1.	29 / 1.	30 / 1.	49 / 1.
Si	40.43	35.44	39.46	39.86	40.42	40.80	39.77	40.00	40.39	39.86
Ti	2.37	2.22	2.36	2.41	2.41	2.10	2.65	2.40	2.55	2.41
Al	10.69	20.54	12.79	11.01	11.07	10.54	11.02	11.11	11.10	11.01
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe^{3+}	19.28	15.89	19.03	19.69	19.04	19.12	19.20	19.45	19.13	19.69
Fe^{2+}	0.21	0.20	0.26	0.17	0.24	0.24	0.25	0.32	0.30	0.17
Mn	8.19	7.06	8.24	7.90	8.01	8.37	8.31	8.40	8.35	7.90
Mg	11.74	9.72	10.91	11.42	11.50	11.55	11.49	10.99	11.42	11.42
Ca	1.22	1.57	1.44	1.37	1.29	1.00	1.44	1.29	1.18	1.37
Na	1.78	2.04	1.70	1.84	1.93	1.81	1.91	1.78	1.84	1.84
K	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zr	**96.56**	**95.57**	**96.89**	**96.37**	**96.47**	**96.30**	**96.81**	**96.46**	**96.97**	**96.37**
TOTAL	6.336	5.516	6.146	6.282	6.328	6.403	6.239	6.280	6.298	6.282
X_{mg}	0.280	0.260	0.276	0.285	0.284	0.248	0.313	0.284	0.300	0.285
Al	1.975	3.769	2.347	2.045	2.042	1.950	2.037	2.057	2.041	2.045
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe(iii)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe(ii)	2.527	2.069	2.478	2.595	2.493	2.510	2.520	2.554	2.494	2.595
Mn	0.028	0.026	0.035	0.022	0.032	0.032	0.033	0.043	0.040	0.022
Mg	1.915	1.637	1.914	1.857	1.870	1.958	1.945	1.965	1.940	1.857
Ca	1.971	1.622	1.821	1.928	1.929	1.941	1.931	1.849	1.908	1.928
Na	0.372	0.473	0.435	0.420	0.391	0.304	0.438	0.394	0.356	0.420
K	0.356	0.405	0.338	0.370	0.386	0.363	0.383	0.357	0.366	0.370
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	15.76	15.78	15.79	15.80	15.75	15.71	15.84	15.78	15.74	15.80
X_{mg}	0.43	0.44	0.45	0.42	0.43	0.44	0.44	0.43	0.44	0.42

$X_{mg} = Mg^{2+}/(Fe^{2+} + Mg^{2+})$

Table 5.3 contd.

Sample	CH-06								CH-12						
Domain	51 / 1.	187 / 1.	188 / 1.	190 / 1.	77 / 1.	78 / 1.	134 / 1.	204 / 1.	136 / 1.	137 / 1.	154 / 1.	155 / 1.	173 / 1.	179 / 1.	167 / 1.
Si	42.55	40.81	41.10	41.26	40.61	40.34	41.31	41.85	40.81	40.44	40.94	40.58	50.54	40.65	41.15
Ti	1.72	2.56	2.25	1.86	2.13	2.45	2.30	1.43	2.38	1.92	2.37	2.42	0.11	2.13	2.76
Al	7.54	10.99	10.95	11.36	11.21	11.23	10.71	11.41	11.00	11.35	11.03	10.82	1.71	11.26	10.23
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe^{3+}	16.23	18.36	18.18	18.02	18.04	16.92	18.32	19.36	18.89	18.49	17.40	17.87	22.50	18.84	19.33
Fe^{2+}	0.15	0.19	0.20	0.18	0.08	0.19	0.29	0.21	0.09	0.32	0.18	0.14	0.66	0.17	0.20
Mn	8.79	8.82	8.87	8.56	8.71	8.47	9.06	8.42	8.67	8.74	8.61	8.64	12.76	8.82	9.01
Mg	15.21	11.30	10.97	11.41	11.71	11.45	11.32	11.53	11.34	11.36	11.46	11.37	10.91	11.68	11.78
Ca	1.31	1.19	1.26	1.14	1.16	1.25	1.17	1.28	1.31	1.44	1.27	1.24	0.23	1.24	1.22
Na	0.98	1.80	1.89	1.82	1.90	1.89	1.77	1.03	1.78	1.79	1.84	1.93	0.02	1.84	1.71
K	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zr	**95.33**	**96.81**	**96.18**	**96.25**	**96.61**	**95.03**	**96.87**	**97.13**	**96.92**	**96.49**	**95.84**	**95.72**	**99.69**	**97.51**	**97.97**
TOTAL	6.702	6.343	6.399	6.418	6.343	6.362	6.399	6.452	6.343	6.314	6.399	6.372	7.519	6.302	6.344
X_{mg}	0.204	0.300	0.264	0.218	0.250	0.290	0.268	0.166	0.278	0.226	0.279	0.286	0.013	0.248	0.320
Al	1.400	2.012	2.009	2.083	2.064	2.087	1.956	2.074	2.014	2.089	2.031	2.002	0.301	2.057	1.858
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe^{2+}	2.137	2.386	2.367	2.343	2.355	2.231	2.373	2.496	2.455	2.414	2.274	2.346	2.798	2.443	2.492
Mn	0.020	0.025	0.026	0.023	0.010	0.025	0.038	0.027	0.012	0.043	0.024	0.019	0.084	0.022	0.026
Mg	2.064	2.045	2.058	1.984	2.029	1.991	2.092	1.935	2.009	2.034	2.006	2.022	2.830	2.038	2.071
Ca	2.567	1.882	1.830	1.901	1.960	1.935	1.878	1.904	1.888	1.900	1.918	1.912	1.739	1.941	1.945
Na	0.399	0.360	0.380	0.343	0.351	0.383	0.352	0.383	0.394	0.435	0.384	0.376	0.067	0.374	0.365
K	0.197	0.358	0.376	0.361	0.378	0.381	0.350	0.203	0.352	0.356	0.367	0.386	0.004	0.363	0.336
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	15.69	15.71	15.71	15.68	15.74	15.69	15.71	15.64	15.74	15.81	15.68	15.72	15.35	15.79	15.76
X_{mg}	0.49	0.46	0.47	0.46	0.46	0.47	0.47	0.44	0.45	0.46	0.47	0.46	0.50	0.45	0.45

$X_{mg} = Mg^{2+}/(Fe^{2+} + Mg^{2+})$

Table 5.4 Chemical analysis and structural formulae (on the basis of 6 Oxygen) of Orthopyroxene from high-Mafic granulites.

Sample	CH-03															
Domain	86 / 1.	87 / 1.	88 / 1.	90 / 1.	91 / 1.	96 / 1.	100 / 1.	101 / 1.	86 / 1.	87 / 1.	88 / 1.	133 / 1.	152 / 1.	153 / 1.	201 / 1.	202 / 1.
SiO_2	50.02	50.36	49.63	50.22	49.32	50.44	50.24	50.07	50.33	51.88	50.61	50.87	50.56	50.07	50.85	50.64
TiO_2	0.07	0.07	0.09	0.05	0.08	0.07	0.09	0.06	0.02	0.05	0.05	0.08	0.08	0.05	0.14	0.08
Al_2O_3	1.08	1.27	1.14	1.14	1.23	1.03	1.16	1.18	1.00	0.90	1.16	0.99	1.26	1.32	1.14	0.86
Cr_2O_3	0.01	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.02
FeO	31.09	31.59	29.97	30.01	29.97	29.52	30.45	30.10	30.09	27.68	30.67	28.97	28.90	29.54	30.44	31.19
MnO	0.72	0.97	0.73	0.68	0.88	0.70	0.56	0.83	0.75	0.55	0.68	0.81	0.77	0.69	0.63	0.74
MgO	15.13	15.41	15.53	15.87	15.41	15.95	16.04	16.01	16.22	16.70	16.37	16.21	15.40	15.60	16.23	15.46
CaO	0.76	0.73	0.80	0.82	0.64	0.71	0.70	0.75	0.77	0.57	0.58	0.61	1.34	0.66	0.78	0.60
Na_2O	0.09	0.07	0.14	0.05	0.16	0.06	0.10	0.08	0.10	0.13	0.06	0.06	0.11	0.10	0.04	0.02
K_2O	0.00	0.00	0.04	0.00	0.08	0.00	0.00	0.00	0.02	0.06	0.01	0.02	0.02	0.00	0.00	0.00
Total	**99.20**	**100.64**	**98.36**	**98.86**	**98.08**	**98.57**	**99.45**	**99.26**	**99.36**	**98.67**	**100.28**	**98.75**	**98.54**	**98.32**	**100.39**	**99.77**
Si	1.971	1.955	1.965	1.972	1.959	1.985	1.961	1.959	1.964	2.026	1.957	1.996	1.991	1.981	1.967	1.983
Ti	0.002	0.002	0.003	0.001	0.002	0.002	0.003	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.004	0.002
Al	0.050	0.058	0.053	0.053	0.058	0.048	0.053	0.054	0.046	0.041	0.053	0.046	0.058	0.062	0.052	0.040
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Fe^{2+}	1.024	1.025	0.992	0.985	0.995	0.972	0.994	0.985	0.981	0.904	0.992	0.950	0.952	0.977	0.985	1.021
Mn	0.024	0.032	0.024	0.023	0.030	0.023	0.018	0.027	0.025	0.018	0.022	0.027	0.026	0.023	0.021	0.025
Mg	0.889	0.892	0.916	0.929	0.912	0.936	0.933	0.934	0.944	0.972	0.944	0.948	0.904	0.920	0.936	0.902
Ca	0.032	0.030	0.034	0.034	0.027	0.030	0.029	0.032	0.032	0.024	0.024	0.026	0.057	0.028	0.032	0.025
Na	0.007	0.005	0.011	0.004	0.012	0.004	0.007	0.006	0.007	0.010	0.005	0.005	0.008	0.007	0.003	0.001
K	0.000	0.000	0.002	0.000	0.004	0.000	0.000	0.000	0.001	0.003	0.001	0.001	0.001	0.000	0.000	0.000
TOTAL	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
End Member																
Wo	1.63	1.53	1.72	1.74	1.39	1.52	1.49	1.60	1.62	1.24	1.22	1.30	2.91	1.44	1.64	1.28
En	45.00	45.00	46.38	47.05	46.21	47.59	47.14	47.13	47.50	50.25	47.59	48.42	46.39	47.01	47.36	45.68
Fs	53.03	53.19	51.34	51.03	51.77	50.67	51.01	50.96	50.52	47.99	50.97	50.04	50.27	51.17	50.83	52.98
X_{mg}	0.46	0.47	0.48	0.49	0.48	0.49	0.48	0.49	0.49	0.52	0.49	0.50	0.49	0.49	0.49	0.47

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.4 contd.

Sample	CH-06													
Domain	7 / 1.	8 / 1.	31 / 1.	32 / 1.	33 / 1.	34 / 1.	41 / 1.	42 / 1.	43 / 1.	44 / 1.	53 / 1.	54 / 1.	55 / 1.	56 / 1.
SiO_2	49.37	50.01	49.91	50.01	50.14	50.30	50.01	50.04	49.46	49.68	50.04	50.16	49.97	51.32
TiO_2	0.10	0.09	0.10	0.07	0.08	0.09	0.08	0.09	0.10	0.09	0.09	0.06	0.09	0.24
Al_2O_3	1.28	1.07	1.12	1.18	1.02	0.96	1.24	1.18	1.12	1.18	1.17	1.21	1.10	3.00
Cr_2O_3	0.03	0.00	0.02	0.04	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00
FeO	30.05	30.81	31.23	31.42	31.11	30.64	30.09	30.12	30.23	30.37	31.36	31.62	31.10	24.69
MnO	0.61	0.56	0.94	0.86	0.95	1.02	0.91	0.65	0.76	0.74	0.68	0.63	0.55	0.55
MgO	15.60	15.60	15.51	15.70	15.68	14.96	15.07	15.18	14.94	15.17	15.03	15.35	15.06	15.01
CaO	0.82	0.68	0.90	0.79	0.72	0.67	0.84	0.99	0.86	0.76	0.72	0.67	0.78	2.21
Na_2O	0.16	0.18	0.18	0.05	0.13	0.16	0.18	0.17	0.25	0.18	0.28	0.05	0.07	0.26
K_2O	0.05	0.05	0.10	0.00	0.02	0.04	0.03	0.01	0.05	0.08	0.00	0.00	0.00	0.66
Total	**98.12**	**99.15**	**100.19**	**100.18**	**100.09**	**98.95**	**98.83**	**98.68**	**98.07**	**98.38**	**99.59**	**99.90**	**98.85**	**98.16**
Si	1.953	1.962	1.942	1.946	1.954	1.985	1.977	1.976	1.968	1.967	1.962	1.961	1.975	2.008
Ti	0.003	0.003	0.003	0.002	0.002	0.003	0.002	0.003	0.003	0.003	0.003	0.002	0.003	0.007
Al	0.060	0.049	0.051	0.054	0.047	0.045	0.058	0.055	0.052	0.055	0.054	0.056	0.051	0.138
Cr	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe^{2+}	0.994	1.011	1.016	1.022	1.014	1.011	0.994	0.995	1.006	1.005	1.028	1.034	1.027	0.808
Mn	0.021	0.019	0.031	0.028	0.031	0.034	0.030	0.022	0.026	0.025	0.022	0.021	0.018	0.018
Mg	0.920	0.912	0.900	0.911	0.911	0.880	0.888	0.894	0.886	0.895	0.879	0.895	0.887	0.876
Ca	0.035	0.029	0.038	0.033	0.030	0.028	0.036	0.042	0.037	0.032	0.030	0.028	0.033	0.093
Na	0.012	0.013	0.014	0.004	0.010	0.012	0.013	0.013	0.019	0.014	0.022	0.004	0.006	0.019
K	0.003	0.002	0.005	0.000	0.001	0.002	0.001	0.001	0.002	0.004	0.000	0.000	0.000	0.033
TOTAL	4	4	4	4	4	4	4	4	4	4	4	4	4	4
End Member														
Wo	1.76	1.45	1.89	1.64	1.50	1.45	1.81	2.14	1.87	1.64	1.53	1.42	1.68	5.08
En	46.51	46.06	45.18	45.69	45.74	44.75	45.26	45.48	44.95	45.45	44.42	45.20	45.00	48.08
Fs	51.12	51.82	52.26	52.48	52.28	53.18	52.24	51.73	52.20	52.20	52.96	53.19	53.04	45.78
X_{mg}	0.48	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.46	0.46	0.46	0.52

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.4 contd.

Sample	**N-14**													
Domain	6 / 1.	7 / 1.	8 / 1.	9 / 1.	10 / 1.	11 / 1.	24 / 1.	27 / 1.	28 / 1.	29 / 1.	31 / 1.	44 / 1.	45 / 1.	46 / 1.
SiO_2	47.91	47.63	48.17	47.57	47.87	48.64	48.33	46.89	47.26	48.54	47.22	47.65	48.13	48.16
TiO_2	0.07	0.04	0.05	0.06	0.05	0.04	0.03	0.07	0.08	0.04	0.03	0.06	0.05	0.07
Al_2O_3	1.53	1.46	1.57	1.45	1.43	1.52	0.98	1.38	1.35	0.69	1.00	1.22	0.97	0.98
Cr_2O_3	0.05	0.10	0.06	0.08	-0.01	0.05	0.01	0.01	0.00	0.00	0.27	0.08	0.13	-0.05
FeO	39.98	39.37	39.92	39.82	39.94	39.42	39.98	40.01	40.53	40.39	39.83	39.09	39.56	39.18
MnO	0.31	0.22	0.50	0.43	0.16	0.48	0.15	0.27	0.23	0.42	0.09	0.52	0.48	0.31
MgO	9.70	9.08	9.45	9.44	9.46	9.31	9.88	9.03	9.54	9.97	9.05	9.22	9.47	9.60
CaO	0.22	0.64	0.72	0.64	0.61	0.59	0.71	0.55	0.66	0.50	0.75	0.79	0.73	0.77
Na_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.00	0.05
K_2O	0.06	0.05	0.04	0.04	0.05	0.05	0.03	0.00	0.06	0.05	0.05	0.07	0.01	0.02
Total	**99.82**	**98.60**	**100.49**	**99.53**	**99.54**	**100.10**	**100.09**	**98.21**	**99.69**	**100.59**	**98.31**	**98.74**	**99.52**	**99.09**
Si	1.950	1.967	1.950	1.945	1.955	1.976	1.961	1.948	1.929	1.961	1.959	1.963	1.968	1.974
Ti	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.002
Al	0.073	0.071	0.075	0.070	0.069	0.073	0.047	0.067	0.065	0.033	0.049	0.059	0.047	0.047
Cr	0.002	0.003	0.002	0.003	0.000	0.002	0.000	0.000	0.000	0.000	0.009	0.003	0.004	-0.002
Fe^{2+}	1.361	1.359	1.351	1.361	1.364	1.339	1.356	1.390	1.383	1.365	1.382	1.346	1.353	1.343
Mn	0.011	0.008	0.017	0.015	0.006	0.017	0.005	0.009	0.008	0.014	0.003	0.018	0.017	0.011
Mg	0.589	0.559	0.570	0.575	0.576	0.564	0.597	0.559	0.581	0.601	0.560	0.566	0.577	0.586
Ca	0.010	0.028	0.031	0.028	0.026	0.026	0.031	0.024	0.029	0.022	0.033	0.035	0.032	0.034
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.000	0.004
K	0.003	0.003	0.002	0.002	0.003	0.002	0.001	0.000	0.003	0.003	0.002	0.003	0.001	0.001
TOTAL	4	4	4	4	4	4	4	4	4	4	4	4	4	4
End Member														
Wo	0.49	1.45	1.59	1.43	1.35	1.32	1.55	1.23	1.44	1.09	1.69	1.77	1.62	1.71
En	29.93	28.59	28.98	29.12	29.24	28.94	30.07	28.25	29.15	30.09	28.32	28.76	29.20	29.66
Fs	69.58	69.96	69.42	69.45	69.42	69.72	68.37	70.52	69.41	68.82	69.91	69.24	69.18	68.41
X_{mg}	0.30	0.29	0.30	0.30	0.30	0.30	0.31	0.29	0.30	0.31	0.29	0.30	0.30	0.30

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.4 contd.

Sample	**BG-04**													
Domain	47 / 1.	48 / 1.	49 / 1.	50 / 1.	52 / 1.	53 / 1.	54 / 1.	55 / 1.	58 / 1.	60 / 1.	61 / 1.	62 / 1.	63 / 1.	64 / 1.
SiO_2	48.75	47.19	48.42	48.05	48.46	48.12	47.44	48.86	48.27	47.98	48.33	49.02	48.92	49.02
TiO_2	0.08	0.06	0.05	0.04	0.04	0.06	0.04	0.05	0.03	0.07	0.02	0.03	0.03	0.04
Al_2O_3	0.98	1.23	1.01	0.87	1.45	1.53	1.63	1.57	1.61	1.65	0.99	1.35	1.53	1.46
Cr_2O_3	-0.01	0.28	0.10	0.09	0.03	0.04	0.12	0.05	0.09	0.19	-0.01	-0.01	0.02	0.06
FeO	39.74	39.78	38.37	39.80	38.37	39.64	40.46	38.40	40.11	37.85	39.43	39.88	39.88	38.57
MnO	0.41	0.11	0.08	0.35	0.28	0.26	0.19	0.18	0.46	0.45	0.15	0.26	0.14	0.21
MgO	9.70	8.98	9.64	9.82	9.20	9.18	9.30	9.36	9.19	8.35	9.50	9.41	9.68	9.88
CaO	0.56	0.72	0.73	0.70	0.66	0.77	0.67	0.66	0.71	0.88	0.64	0.41	0.49	0.52
Na_2O	0.03	0.04	0.02	0.01	0.05	0.19	0.01	0.00	0.00	0.63	0.00	0.00	0.00	0.02
K_2O	0.04	0.04	0.08	0.03	0.06	0.06	0.06	0.05	0.05	0.10	0.03	0.05	0.04	0.02
Total	100.27	98.43	98.51	99.75	98.59	99.36	99.92	99.19	100.52	98.16	99.09	100.41	100.74	99.81
Si	1.976	1.955	1.993	1.957	1.996	1.957	1.933	1.999	1.956	1.980	1.983	1.986	1.971	1.989
Ti	0.002	0.002	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.001
Al	0.047	0.060	0.049	0.042	0.070	0.073	0.078	0.076	0.077	0.080	0.048	0.064	0.073	0.070
Cr	0.000	0.009	0.003	0.003	0.001	0.001	0.004	0.002	0.003	0.006	0.000	0.000	0.001	0.002
Fe^{2+}	1.347	1.378	1.321	1.356	1.321	1.348	1.379	1.313	1.359	1.307	1.353	1.351	1.344	1.308
Mn	0.014	0.004	0.003	0.012	0.010	0.009	0.007	0.006	0.016	0.016	0.005	0.009	0.005	0.007
Mg	0.586	0.554	0.592	0.596	0.565	0.557	0.565	0.571	0.555	0.514	0.581	0.569	0.582	0.598
Ca	0.024	0.032	0.032	0.031	0.029	0.034	0.029	0.029	0.031	0.039	0.028	0.018	0.021	0.023
Na	0.002	0.003	0.002	0.001	0.004	0.015	0.000	0.000	0.000	0.050	0.000	0.000	0.000	0.001
K	0.002	0.002	0.004	0.001	0.003	0.003	0.003	0.003	0.003	0.005	0.002	0.002	0.002	0.001
TOTAL	4	4	4	4	4	4	4	4	4	4	4	4	4	4
End Member														
Wo	1.22	1.63	1.66	1.54	1.50	1.72	1.48	1.51	1.57	2.03	1.44	0.92	1.08	1.17
En	29.71	28.15	30.29	29.95	29.18	28.40	28.62	29.61	28.32	26.70	29.51	29.15	29.78	30.76
Fs	68.95	70.04	67.96	68.47	69.12	69.10	69.88	68.86	70.11	68.67	69.05	69.93	69.13	68.00
X_{mg}	0.30	0.29	0.31	0.31	0.30	0.29	0.29	0.30	0.29	0.28	0.30	0.30	0.30	0.31

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.5 Chemical analysis and structural formulae (on the basis of 6 Oxygen) of Orthopyroxene from Pelitic granulites.

Sample	BK-05													
Domain	65 / 1.	66 / 1.	95 / 1.	96 / 1.	97 / 1.	98 / 1.	99 / 1.	100 / 1.	101 / 1.	103 / 1.	105 / 1.	107 / 1.	108 / 1.	45 / 1.
SiO_2	47.87	47.80	48.75	49.12	48.82	49.08	49.20	48.99	49.51	49.29	49.50	49.03	49.04	50.19
TiO_2	0.05	0.03	0.06	0.05	0.08	0.07	0.06	0.05	0.06	0.06	0.06	0.08	0.06	0.15
Al_2O_3	1.51	1.55	1.37	1.33	1.26	1.31	1.36	1.41	1.44	1.35	0.89	1.38	1.35	1.04
Cr_2O_3	0.34	0.01	0.06	0.04	0.12	0.04	0.18	0.09	-0.03	0.06	0.02	-0.05	0.12	0.05
FeO	38.68	39.87	36.57	36.57	37.76	36.44	35.39	36.53	36.46	36.82	36.53	37.44	37.31	29.84
MnO	0.25	0.22	0.33	0.42	0.19	0.29	0.26	0.17	0.52	0.59	0.49	0.27	0.47	0.54
MgO	9.07	9.49	12.23	11.86	12.26	11.97	12.17	12.05	12.24	12.27	12.45	11.89	11.97	15.70
CaO	0.84	0.52	0.32	0.28	0.38	0.34	0.30	0.42	0.33	0.41	0.27	0.28	0.31	0.57
Na_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
K_2O	0.06	0.08	0.06	0.03	0.04	0.07	0.05	0.05	0.06	0.04	0.05	0.04	0.07	0.00
Total	98.66	99.57	99.75	99.70	100.90	99.61	98.96	99.75	100.59	100.90	100.25	10034.00	100.70	98.55
Si	1.974	1.951	1.950	1.970	1.935	1.969	1.981	1.961	1.964	1.951	1.970	1.956	1.949	1.986
Ti	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.005
Al	0.073	0.075	0.065	0.063	0.059	0.062	0.064	0.066	0.067	0.063	0.042	0.065	0.063	0.048
Cr	0.011	0.000	0.002	0.001	0.004	0.001	0.006	0.003	-0.001	0.002	0.001	-0.002	0.004	0.002
Fe^{2+}	1.334	1.361	1.223	1.227	1.251	1.222	1.192	1.223	1.210	1.219	1.216	1.249	1.240	0.987
Mn	0.009	0.008	0.011	0.014	0.006	0.010	0.009	0.006	0.017	0.020	0.017	0.009	0.016	0.018
Mg	0.558	0.577	0.730	0.709	0.724	0.716	0.731	0.719	0.724	0.724	0.739	0.707	0.709	0.926
Ca	0.037	0.023	0.014	0.012	0.016	0.015	0.013	0.018	0.014	0.017	0.011	0.012	0.013	0.024
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
K	0.003	0.004	0.003	0.001	0.002	0.004	0.003	0.002	0.003	0.002	0.002	0.002	0.004	0.000
TOTAL	4	4	4	4	4	4	4	4	4	4	4	4	4	4
End Member														
Wo	1.91	1.15	0.69	0.61	0.82	0.75	0.66	0.92	0.71	0.87	0.58	0.60	0.67	1.24
En	28.73	29.37	36.96	36.13	36.37	36.48	37.53	36.60	36.85	36.63	37.29	35.82	35.91	47.22
Fs	69.36	69.48	62.35	63.26	62.82	62.77	61.82	62.48	62.44	62.50	62.14	63.58	63.42	51.37
X_{mg}	0.29	0.30	0.37	0.37	0.37	0.37	0.38	0.37	0.37	0.37	0.38	0.36	0.36	0.48

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.5 contd.

Sample	SG-03								
Domain	79 / 1.	80 / 1.	81 / 1.	83 / 1.	84 / 1.	85 / 1.	86 / 1.	89 / 1.	90 / 1.
SiO_2	50.51	50.57	50.34	50.31	50.22	50.38	50.20	50.50	50.25
TiO_2	0.11	0.16	0.13	0.12	0.12	0.13	0.13	0.11	0.15
Al_2O_3	1.27	1.16	1.24	1.27	1.32	1.15	1.07	1.13	1.15
Cr_2O_3	0.06	0.02	0.04	0.05	0.04	0.06	0.05	0.05	0.05
FeO	29.28	29.50	29.82	30.51	29.10	29.08	30.30	30.13	29.01
MnO	0.37	0.51	0.62	0.75	0.55	0.58	0.48	0.65	0.76
MgO	16.65	16.53	16.72	16.68	16.24	16.62	16.14	16.30	16.25
CaO	0.80	0.83	0.82	0.64	0.72	0.69	0.67	1.18	1.53
Na_2O	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.02
K_2O	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.01
Total	99.25	99.53	99.95	100.49	98.60	99.22	99.64	100.38	99.33
Si	1.969	1.969	1.951	1.942	1.975	1.971	1.966	1.956	1.959
Ti	0.003	0.005	0.004	0.003	0.004	0.004	0.004	0.003	0.004
Al	0.058	0.053	0.057	0.058	0.061	0.053	0.050	0.052	0.053
Cr	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.002	0.002
Fe^{2+}	0.954	0.961	0.967	0.985	0.957	0.952	0.992	0.976	0.946
Mn	0.012	0.017	0.020	0.025	0.018	0.019	0.016	0.021	0.025
Mg	0.968	0.959	0.966	0.960	0.952	0.969	0.942	0.941	0.945
Ca	0.033	0.035	0.034	0.026	0.031	0.029	0.028	0.049	0.064
Na	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.002
K	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000
TOTAL	4	4	4	4	4	4	4	4	4
End Member									
Wo	1.69	1.76	1.72	1.32	1.56	1.46	1.42	2.46	3.23
En	49.17	48.66	48.69	48.20	48.58	49.20	47.65	47.39	47.72
Fs	49.13	49.58	49.60	50.48	49.86	49.28	50.93	50.11	48.97
X_{mg}	0.50	0.50	0.50	0.49	0.50	0.50	0.49	0.49	0.50

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.6 Chemical analysis and structural formulae (on the basis of 6 Oxygen) of Clinopyroxene from mafic granulites.

Sample	CH-03											
Domain	79 / 1.	80 / 1.	81 / 1.	82 / 1.	104 / 1.	105 / 1.	106 / 1.	107 / 1.	138 / 1.	150 / 1.	151 / 1.	158 / 1.
SiO_2	49.15	50.48	49.93	50.45	50.47	50.23	50.32	50.57	49.47	50.53	49.12	50.64
TiO_2	0.22	0.27	0.20	0.23	0.23	0.22	0.21	0.23	0.23	0.21	0.20	0.21
Al_2O_3	2.27	2.12	2.26	2.17	2.25	2.14	2.18	2.22	2.86	2.10	2.68	2.05
Cr_2O_3	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.01
FeO	12.05	12.89	12.08	12.17	12.29	12.64	12.66	14.09	11.70	12.23	10.96	12.57
MnO	0.32	0.27	0.35	0.44	0.30	0.26	0.45	0.35	0.14	0.39	0.46	0.24
MgO	10.80	11.19	10.86	11.01	11.37	11.01	11.17	11.20	11.04	11.33	11.25	10.93
CaO	21.67	21.40	20.96	21.63	20.58	21.53	20.79	20.79	21.49	21.36	21.10	21.14
Na_2O	0.71	0.40	0.47	0.44	0.59	0.65	0.40	0.41	0.56	0.41	0.49	0.39
K_2O	0.06	0.00	0.04	0.00	0.03	0.05	0.01	0.00	0.13	0.05	0.19	0.01
Total	97.58	99.14	97.35	98.68	98.35	99.16	98.36	100.04	97.79	98.76	96.69	98.30
Si	1.906	1.931	1.944	1.937	1.941	1.922	1.940	1.923	1.909	1.937	1.916	1.954
Ti	0.006	0.008	0.006	0.007	0.007	0.006	0.006	0.007	0.007	0.006	0.006	0.006
Al	0.104	0.096	0.104	0.098	0.102	0.096	0.099	0.099	0.130	0.095	0.123	0.093
Cr	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Fe^{2+}	0.391	0.412	0.393	0.391	0.395	0.405	0.408	0.448	0.377	0.392	0.357	0.406
Mn	0.010	0.009	0.012	0.014	0.010	0.008	0.015	0.011	0.004	0.013	0.015	0.008
Mg	0.625	0.638	0.630	0.630	0.652	0.628	0.642	0.635	0.635	0.647	0.654	0.629
Ca	0.900	0.877	0.874	0.890	0.848	0.883	0.859	0.847	0.889	0.877	0.882	0.874
Na	0.054	0.030	0.035	0.033	0.044	0.048	0.030	0.030	0.042	0.030	0.037	0.029
K	0.003	0.000	0.002	0.000	0.002	0.002	0.000	0.000	0.006	0.002	0.010	0.000
TOTAL	4	4	4	4	4	4	4	4	4	4	4	4
End Member												
Wo	45.57	44.66	44.98	45.48	43.54	44.83	43.97	43.01	45.68	44.81	45.39	44.94
En	31.61	32.50	32.43	32.21	33.48	31.90	32.89	32.25	32.66	33.06	33.66	32.32
Fs	20.10	21.34	20.77	20.63	20.72	20.81	21.59	23.19	19.49	20.59	19.06	21.23
X_{mg}	0.62	0.61	0.62	0.62	0.62	0.61	0.61	0.59	0.63	0.62	0.65	0.61

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.6 contd.

Sample No.	CH-06											
Domain	159 / 1.	160 / 1.	174 / 1.	175 / 1.	176 / 1.	177 / 1.	178 / 1.	45 / 1.	46 / 1.	47 / 1.	48 / 1.	63 / 1.
SiO_2	50.57	51.39	50.80	50.98	50.92	51.00	50.79	49.94	50.02	48.15	50.35	50.25
TiO_2	0.23	0.23	0.24	0.20	0.22	0.22	0.21	0.30	0.25	0.23	0.23	0.30
Al_2O_3	1.95	2.14	2.14	2.11	1.86	2.18	2.09	2.54	2.52	3.91	2.10	2.60
Cr_2O_3	0.01	0.02	0.03	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02
FeO	12.83	10.86	13.09	12.47	13.46	11.72	12.29	14.56	14.06	13.11	12.74	14.06
MnO	0.34	0.31	0.43	0.43	0.38	0.41	0.29	0.33	0.44	0.42	0.36	0.29
MgO	11.29	11.50	11.02	11.39	11.34	11.04	11.08	10.75	11.02	9.87	10.70	10.66
CaO	20.63	22.48	21.39	21.60	20.48	21.86	21.46	19.67	20.29	20.10	21.71	21.06
Na_2O	0.42	0.37	0.45	0.38	0.42	0.38	0.49	0.52	0.51	0.80	0.47	0.43
K_2O	0.01	0.00	0.00	0.03	0.01	0.05	0.03	0.04	0.00	0.17	0.00	0.00
Total	98.39	99.36	99.67	99.70	99.33	99.18	98.98	98.85	99.40	97.02	98.96	99.75
Si	1.948	1.951	1.934	1.936	1.949	1.951	1.945	1.925	1.915	1.883	1.935	1.917
Ti	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.009	0.007	0.007	0.007	0.009
Al	0.089	0.096	0.096	0.094	0.084	0.098	0.094	0.115	0.114	0.180	0.095	0.117
Cr	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Fe^{2+}	0.413	0.345	0.417	0.396	0.431	0.375	0.394	0.469	0.450	0.429	0.409	0.449
Mn	0.011	0.010	0.014	0.014	0.012	0.013	0.009	0.011	0.014	0.014	0.012	0.009
Mg	0.649	0.651	0.626	0.645	0.647	0.629	0.633	0.618	0.629	0.575	0.613	0.607
Ca	0.851	0.914	0.872	0.879	0.840	0.896	0.880	0.812	0.832	0.842	0.894	0.861
Na	0.031	0.028	0.033	0.028	0.031	0.028	0.037	0.039	0.038	0.061	0.035	0.031
K	0.000	0.000	0.000	0.001	0.000	0.002	0.002	0.002	0.000	0.009	0.000	0.000
TOTAL	4	4	4	4	4	4	4	4	4	4	4	4
End Member												
Wo	43.56	46.97	44.51	44.84	42.85	46.16	45.11	41.72	42.46	43.93	45.57	44.04
En	33.18	33.43	31.92	32.91	33.03	32.42	32.42	31.75	32.09	30.02	31.26	31.03
Fs	21.65	18.19	21.88	20.83	22.55	19.97	20.59	24.53	23.53	22.89	21.37	23.32
X_{mg}	0.61	0.65	0.60	0.62	0.60	0.63	0.62	0.57	0.58	0.57	0.60	0.57

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.6 contd.

Sample No.						N-14					
Domain	64 / 1.	65 / 1.	66 / 1.	35 / 1.	36 / 1.	37 / 1.	38 / 1.	39 / 1.	40 / 1.	41 / 1.	42 / 1.
SiO_2	50.32	50.32	50.26	49.86	49.63	49.69	48.15	49.49	49.86	49.47	49.06
TiO_2	0.27	0.26	0.23	0.34	0.37	0.35	0.30	0.31	0.28	0.33	0.28
Al_2O_3	2.51	2.26	2.40	2.49	2.45	2.98	2.42	2.37	2.24	2.23	2.61
Cr_2O_3	0.03	0.00	0.00	0.00	0.03	0.04	0.05	0.02	0.05	0.02	0.03
FeO	13.91	13.64	15.06	11.24	10.94	11.46	12.75	12.11	12.31	12.89	13.96
MnO	0.47	0.24	0.35	0.33	0.27	0.29	0.25	0.19	0.29	0.27	0.27
MgO	10.77	11.10	10.94	10.71	10.79	10.91	11.01	10.80	11.00	11.12	9.04
CaO	21.03	20.62	20.16	22.36	21.78	20.52	20.95	22.15	21.86	20.57	20.51
Na_2O	0.43	0.40	0.41	0.27	0.30	0.23	0.27	0.40	0.48	0.40	0.51
K_2O	0.00	0.00	0.01	0.03	0.02	0.09	0.00	0.06	0.03	0.01	0.32
Total	100.00	98.99	99.95	98.00	96.70	96.64	96.39	98.33	98.69	97.49	96.77
Si	1.918	1.932	1.917	1.932	1.942	1.946	1.897	1.913	1.916	1.926	1.941
Ti	0.008	0.007	0.006	0.010	0.011	0.010	0.009	0.009	0.008	0.010	0.008
Al	0.113	0.102	0.108	0.114	0.113	0.138	0.112	0.108	0.101	0.102	0.122
Cr	0.001	0.000	0.000	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.001
Fe^{2+}	0.443	0.438	0.480	0.364	0.358	0.375	0.420	0.391	0.396	0.420	0.462
Mn	0.015	0.008	0.011	0.011	0.009	0.010	0.008	0.006	0.010	0.009	0.009
Mg	0.612	0.635	0.622	0.619	0.630	0.637	0.647	0.622	0.630	0.645	0.533
Ca	0.858	0.848	0.824	0.929	0.913	0.861	0.884	0.917	0.900	0.858	0.869
Na	0.032	0.030	0.030	0.020	0.023	0.017	0.021	0.030	0.036	0.030	0.039
K	0.000	0.000	0.000	0.002	0.001	0.004	0.000	0.003	0.002	0.000	0.016
TOTAL	4	4	4	4	4	4	4	4	4	4	4
End Member											
Wo	43.84	43.33	41.93	47.81	47.25	45.29	44.73	46.69	45.72	43.78	45.49
En	31.24	32.48	31.67	31.87	32.59	33.50	32.72	31.66	32.02	32.93	27.90
Fs	23.29	22.67	24.87	19.27	18.99	20.30	21.51	20.11	20.44	21.76	24.57
X_{mg}	0.58	0.59	0.56	0.63	0.64	0.63	0.61	0.61	0.61	0.61	0.54

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.6 contd.

Sample No.	BG-03									
Domain	52 / 1.	53 / 1.	54 / 1.	55 / 1.	56 / 1.	57 / 1.	58 / 1.	70 / 1.	71 / 1.	72 / 1.
SiO_2	49.41	49.47	49.49	49.25	49.77	48.97	49.79	51.03	51.28	51.28
TiO_2	0.29	0.29	0.29	0.23	0.26	0.23	0.23	0.32	0.30	0.27
Al_2O_3	2.28	2.38	2.20	1.98	1.86	2.45	2.15	2.22	2.03	2.30
Cr_2O_3	0.09	0.06	0.01	0.09	0.06	0.09	0.15	0.05	0.03	0.02
FeO	11.71	12.91	12.50	11.50	13.66	12.75	11.91	11.58	12.05	11.22
MnO	0.28	0.24	0.15	0.24	0.24	0.19	0.18	0.18	0.24	0.23
MgO	10.99	10.70	10.87	10.83	11.18	10.52	10.56	11.55	11.31	11.84
CaO	22.08	21.24	20.79	21.77	21.22	21.71	21.84	20.40	21.01	20.61
Na_2O	0.25	0.37	0.34	0.30	0.45	0.41	0.39	0.24	0.35	0.26
K_2O	0.01	0.00	0.00	0.04	0.01	0.00	0.00	0.01	0.00	0.00
Total	97.72	97.87	96.93	96.62	98.89	97.67	97.42	97.66	99.02	98.30
Si	1.920	1.922	1.940	1.936	1.912	1.908	1.941	1.976	1.967	1.972
Ti	0.008	0.009	0.009	0.007	0.008	0.007	0.007	0.009	0.009	0.008
Al	0.105	0.109	0.101	0.092	0.084	0.112	0.099	0.101	0.092	0.104
Cr	0.003	0.002	0.000	0.003	0.002	0.003	0.005	0.001	0.001	0.001
Fe^{2+}	0.380	0.419	0.410	0.378	0.439	0.415	0.388	0.375	0.387	0.361
Mn	0.009	0.008	0.005	0.008	0.008	0.006	0.006	0.006	0.008	0.007
Mg	0.637	0.620	0.635	0.635	0.640	0.611	0.614	0.667	0.647	0.679
Ca	0.919	0.884	0.873	0.917	0.873	0.906	0.912	0.846	0.864	0.849
Na	0.019	0.028	0.026	0.023	0.033	0.031	0.029	0.018	0.026	0.019
K	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.001	0.000	0.000
TOTAL	4	4	4	4	4	4	4	4	4	4
End Member										
Wo	46.84	45.16	44.82	46.80	43.89	46.08	46.81	44.23	44.71	44.30
En	32.44	31.67	32.61	32.41	32.18	31.07	31.50	34.85	33.49	35.42
Fs	19.76	21.73	21.25	19.64	22.25	21.29	20.18	19.99	20.46	19.29
X_{mg}	0.63	0.60	0.61	0.63	0.59	0.60	0.61	0.64	0.63	0.65

X_{Wo} = Ca/(Ca+Mg+Fe^T); X_{En}= Mg/(Ca+Mg+Fe^T); X_{Fs} = Fe^T/(Ca+Mg+FeT); X_{Mg} = Mg/(Fe^{2+}+Mg)

Table 5.7 Chemical analysis and structural formulae (on the basis of 18 Oxygen) of Cordierite from Pelitic Granulites.

Sample	BK-05									
Domain	101/1	102/1	103/1	104/1	107/1	108/1	109/1	110/1	50/1	51/1
SiO_2	49.36	48.93	49.17	49.38	48.87	49.28	47.85	48.29	49.50	48.89
TiO_2	0.01	0.01	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.01
Al_2O_3	31.19	32.28	31.56	32.33	31.86	32.49	32.65	32.52	31.59	32.57
FeO	7.23	7.95	8.52	7.82	8.69	8.59	8.17	8.53	7.98	7.28
MnO	0.02	0.01	0.01	0.00	0.01	0.05	0.06	0.05	0.02	0.05
MgO	8.74	9.12	8.22	9.41	7.96	7.49	7.98	7.54	8.25	8.05
CaO	0.01	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00
Na_2O	0.11	0.10	0.13	0.00	0.01	0.16	0.12	0.18	0.16	0.13
K_2O	0.01	0.02	0.01	0.00	0.02	0.02	0.01	0.03	0.03	0.02
TOTAL	96.68	98.43	97.62	98.95	97.43	98.09	96.98	97.14	97.53	97.00
Si	5.133	5.024	5.097	5.036	5.078	5.081	4.997	5.034	5.120	5.068
Ti	0.001	0.001	0.000	0.000	0.001	0.001	0.002	0.000	0.000	0.001
Al	3.823	3.906	3.855	3.886	3.901	3.948	4.018	3.995	3.851	3.979
Fe^{2+}	0.629	0.683	0.738	0.667	0.755	0.741	0.713	0.744	0.690	0.631
Mn	0.002	0.001	0.001	0.000	0.001	0.004	0.005	0.004	0.002	0.004
Mg	1.355	1.396	1.270	1.431	1.233	1.151	1.242	1.172	1.272	1.244
Ca	0.001	0.001	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.000
Na	0.022	0.020	0.026	0.000	0.002	0.032	0.024	0.036	0.032	0.026
K	0.001	0.003	0.001	0.000	0.003	0.003	0.001	0.004	0.004	0.003
TOTAL	10.967	11.034	10.989	11.021	10.973	10.961	11.005	10.989	10.972	10.956
X_{mg}	0.68	0.67	0.63	0.68	0.62	0.61	0.64	0.61	0.65	0.66

$X_{Mg} = Mg/(Fe^{2+}+Mg)$

Table 5.7 contd.

Sample	SG-03									
Domain	53/1	79/1	57/1	58/1	60/1	61/1	62/1	63/1	64/1	65/1
SiO_2	49.11	49.25	49.06	48.75	49.08	48.71	49.88	49.68	48.59	48.73
TiO_2	0.02	0.00	0.01	0.02	0.01	0.02	0.02	0.03	0.00	0.02
Al_2O_3	32.29	31.94	32.41	31.48	32.43	31.99	32.59	32.17	32.66	31.96
FeO	7.59	8.25	8.16	7.82	8.15	7.59	7.21	8.23	8.19	8.59
MnO	0.04	0.03	0.02	0.01	0.02	0.00	0.02	0.02	0.01	0.02
MgO	8.09	8.51	7.99	8.89	7.56	8.22	8.56	7.43	7.84	7.94
CaO	0.02	0.00	0.00	0.00	0.01	0.05	0.01	0.01	0.02	0.01
Na_2O	0.09	0.15	0.14	0.12	0.05	0.17	0.14	0.13	0.11	0.15
K_2O	0.04	0.04	0.01	0.02	0.02	0.04	0.02	0.01	0.01	0.02
TOTAL	97.29	98.17	97.80	97.11	97.33	96.79	98.45	97.71	97.43	97.44
Si	5.083	5.073	5.066	5.069	5.087	5.073	5.091	5.128	5.038	5.065
Ti	0.002	0.000	0.001	0.002	0.001	0.002	0.002	0.002	0.000	0.002
Al	3.939	3.877	3.944	3.858	3.961	3.926	3.920	3.913	3.991	3.915
Fe^{2+}	0.657	0.711	0.705	0.680	0.706	0.661	0.615	0.710	0.710	0.747
Mn	0.004	0.003	0.002	0.001	0.002	0.000	0.002	0.002	0.001	0.002
Mg	1.248	1.307	1.230	1.378	1.168	1.276	1.302	1.143	1.212	1.230
Ca	0.002	0.000	0.000	0.000	0.001	0.006	0.001	0.001	0.002	0.001
Na	0.018	0.030	0.028	0.024	0.010	0.034	0.028	0.026	0.022	0.030
K	0.005	0.005	0.001	0.003	0.003	0.005	0.003	0.001	0.001	0.003
TOTAL	10.958	11.006	10.976	11.014	10.938	10.983	10.963	10.927	10.978	10.993
X_{mg}	0.66	0.65	0.64	0.67	0.62	0.66	0.68	0.62	0.63	0.62

$X_{Mg} = Mg/(Fe^{2+}+Mg)$

Table 5.8 Chemical analysis and structural formulae (on the basis of 22 Oxygen) of biotite from Mafic Granulites.

Sample						**CH-03**						
Domain	75 / 1.	76 / 1.	77 / 1.	78 / 1.	142 / 1.	143 / 1.	144 / 1.	145 / 1.	146 / 1.	147 / 1.	148 / 1.	181 / 1.
SiO_2	35.35	35.05	35.49	34.40	34.99	34.26	34.12	34.57	34.75	34.41	34.12	34.86
TiO_2	3.64	3.56	3.76	3.65	3.77	3.79	3.68	4.26	3.64	3.70	3.46	3.77
Al_2O_3	13.83	13.90	13.81	13.82	14.05	13.94	13.82	14.49	14.09	13.76	14.02	13.91
Cr_2O_3	0.01	0.04	0.04	0.01	0.03	0.04	0.05	0.02	0.02	0.00	0.04	0.04
FeO	21.28	21.26	20.23	20.22	22.10	20.91	20.75	21.05	21.31	21.09	21.43	21.93
MnO	0.11	0.08	0.11	0.01	0.08	0.04	0.07	0.18	0.11	0.18	0.05	0.03
MgO	10.00	10.05	9.86	9.55	9.78	9.42	9.26	9.92	9.92	9.54	9.50	9.67
CaO	0.02	0.02	0.01	0.03	0.00	0.02	0.18	0.09	0.04	0.05	0.07	0.00
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na_2O	0.18	0.23	0.35	0.49	0.22	0.38	0.56	0.32	0.26	0.45	0.63	0.46
K_2O	8.36	8.31	8.43	8.16	8.09	8.05	8.11	8.13	8.29	8.09	8.30	8.36
Cl	0.26	0.26	0.29	0.39	0.31	0.46	0.40	0.35	0.38	0.50	0.65	0.49
F	0.43	0.37	0.23	0.31	0.05	0.11	0.01	0.25	0.14	0.16	0.21	0.26
Total	93.58	93.38	92.77	91.27	93.60	91.52	91.04	93.77	93.04	92.00	92.66	93.84
Si	5.587	5.560	5.626	5.568	5.527	5.526	5.530	5.447	5.519	5.534	5.482	5.517
Al^{iv}	2.413	2.440	2.374	2.432	2.473	2.474	2.470	2.553	2.481	2.466	2.518	2.483
Cr	0.002	0.005	0.005	0.001	0.004	0.006	0.007	0.002	0.002	0.000	0.004	0.006
Al^{vi}	0.163	0.159	0.206	0.204	0.142	0.176	0.170	0.138	0.157	0.142	0.136	0.113
Ti	0.433	0.425	0.448	0.444	0.447	0.460	0.449	0.505	0.435	0.448	0.418	0.448
Fe^{2+}	2.813	2.820	2.681	2.736	2.918	2.820	2.813	2.773	2.830	2.836	2.879	2.903
Mn	0.015	0.010	0.015	0.002	0.010	0.006	0.009	0.023	0.015	0.024	0.007	0.004
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	2.356	2.378	2.331	2.304	2.304	2.265	2.238	2.331	2.350	2.288	2.276	2.281
Ca	0.004	0.004	0.002	0.006	0.001	0.004	0.030	0.015	0.006	0.009	0.013	0.000
Na	0.055	0.071	0.108	0.153	0.067	0.119	0.175	0.099	0.080	0.140	0.197	0.142
K	1.685	1.682	1.705	1.685	1.630	1.656	1.677	1.635	1.679	1.659	1.700	1.688
Cl	0.071	0.071	0.078	0.107	0.084	0.125	0.109	0.093	0.101	0.135	0.176	0.130
F	0.217	0.187	0.113	0.160	0.025	0.057	0.006	0.125	0.069	0.082	0.107	0.130
TOTAL	15.526	15.554	15.501	15.535	15.523	15.511	15.569	15.522	15.724	15.546	15.632	15.584
X_{mg}	0.46	0.46	0.47	0.46	0.44	0.45	0.44	0.46	0.45	0.45	0.44	0.44

$X_{Mg} = Mg/(Fe^{2+}+Mg)$

Table 5.8 contd.

Sample	CH-06											
Domain	182 / 1.	191 / 1.	192 / 1.	193 / 1.	194 / 1.	197 / 1.	198 / 1.	199 / 1.	39 / 1.	60 / 1.	61 / 1.	62 / 1.
SiO_2	34.18	34.66	34.81	31.73	34.80	35.12	34.96	34.76	35.10	35.02	34.98	35.12
TiO_2	3.65	3.60	3.66	10.18	3.55	3.79	3.87	3.64	3.54	3.97	3.72	3.72
Al_2O_3	13.70	14.01	14.05	12.47	14.30	13.88	13.87	13.79	13.88	13.67	13.67	13.81
Cr_2O_3	0.03	0.00	0.00	0.04	0.01	0.02	0.05	0.01	0.06	0.02	0.03	0.02
FeO	21.26	21.54	20.64	23.83	21.23	21.23	21.40	20.41	20.38	21.56	20.63	21.22
MnO	0.05	0.09	0.07	0.30	0.08	0.07	0.03	0.07	0.13	0.13	0.10	0.00
MgO	9.76	9.63	9.65	8.55	9.73	9.98	9.89	10.30	10.08	9.60	9.61	9.80
CaO	0.03	0.05	0.05	1.68	0.07	0.00	0.02	0.05	0.04	0.04	0.05	0.05
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na_2O	0.70	0.30	0.18	0.32	0.21	0.20	0.25	0.17	0.29	0.29	0.38	0.31
K_2O	8.34	8.03	8.17	6.25	8.08	8.10	8.11	7.83	8.52	8.30	8.24	8.30
Cl	0.54	0.35	0.29	0.26	0.27	0.31	0.31	0.31	0.35	0.38	0.40	0.40
F	0.14	0.16	0.17	0.04	0.14	0.19	0.35	0.15	0.30	0.37	0.23	0.35
Total	92.57	92.45	91.83	95.75	92.70	92.92	93.40	91.60	92.71	93.36	92.16	93.32
Si	5.489	5.538	5.576	4.982	5.539	5.565	5.546	5.569	5.580	5.559	5.600	5.574
Al^{iv}	2.511	2.462	2.424	2.308	2.461	2.435	2.454	2.431	2.420	2.441	2.400	2.426
Cr	0.004	0.000	0.000	0.005	0.001	0.003	0.007	0.001	0.008	0.002	0.004	0.002
Al^{vi}	0.082	0.175	0.228	0.000	0.222	0.158	0.139	0.172	0.180	0.117	0.178	0.157
Ti	0.441	0.433	0.441	1.202	0.425	0.452	0.462	0.438	0.424	0.473	0.448	0.445
Fe^{2+}	2.856	2.877	2.765	3.130	2.826	2.813	2.839	2.735	2.710	2.862	2.762	2.817
Mn	0.007	0.012	0.009	0.039	0.010	0.009	0.004	0.009	0.018	0.018	0.013	0.000
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	2.338	2.294	2.304	2.002	2.308	2.358	2.338	2.460	2.390	2.271	2.294	2.319
Ca	0.005	0.008	0.008	0.283	0.012	0.000	0.004	0.009	0.007	0.007	0.009	0.008
Na	0.218	0.094	0.057	0.097	0.066	0.060	0.077	0.051	0.090	0.089	0.117	0.096
K	1.710	1.636	1.669	1.251	1.641	1.637	1.642	1.599	1.728	1.681	1.682	1.681
Cl	0.147	0.095	0.079	0.070	0.073	0.084	0.083	0.083	0.095	0.103	0.107	0.107
F	0.069	0.081	0.088	0.019	0.069	0.094	0.174	0.076	0.151	0.187	0.114	0.175
TOTAL	15.662	15.529	15.481	15.298	15.511	15.491	15.510	15.475	15.554	15.521	15.507	15.524
X_{mg}	0.45	0.44	0.45	0.39	0.45	0.46	0.45	0.47	0.47	0.44	0.45	0.45

$X_{Mg} = Mg/(Fe^{2+}+Mg)$

Table 5.9 Chemical analysis and structural formulae (on the basis of 22 Oxygen) of biotite from Pelitic Granulites.

Sample	**BK-05**														
Domain	74 / 1.	75 / 1.	21 / 1.	22 / 1.	23 / 1.	24 / 1.	26 / 1.	27 / 1.	28 / 1.	29 / 1.	30 / 1.	31 / 1.	32 / 1.	33 / 1.	34 / 1.
SiO_2	34.74	34.97	37.74	37.53	37.76	36.05	35.83	36.05	37.53	36.97	36.28	36.66	37.68	37.24	37.33
TiO_2	3.80	3.62	0.97	1.03	0.89	0.97	0.99	0.85	0.88	0.93	0.89	1.03	0.99	1.00	0.94
Al_2O_3	14.32	14.81	17.15	17.16	16.89	16.87	16.41	16.33	15.99	16.64	16.63	17.73	17.42	16.72	17.34
Cr_2O_3	0.10	0.07	0.00	0.05	0.00	0.11	0.21	0.05	0.07	0.00	0.05	0.00	0.00	0.00	0.07
FeO	21.92	21.97	15.73	15.47	16.12	17.77	18.41	17.00	19.08	16.19	17.29	16.11	16.39	16.11	15.85
MnO	0.10	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	9.89	9.89	13.86	13.27	13.90	13.08	13.90	13.67	12.19	12.82	13.47	12.26	13.62	13.03	13.06
CaO	0.03	0.02	0.00	0.00	0.00	0.06	0.16	0.00	0.04	0.00	0.02	0.00	0.00	0.00	0.00
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na_2O	0.16	0.13	0.38	0.42	0.57	0.34	0.45	0.38	0.35	0.38	0.46	0.49	0.46	0.45	0.45
K_2O	7.95	8.26	8.22	8.14	8.13	7.19	7.36	7.65	6.31	8.23	7.29	7.94	8.17	8.32	8.22
Cl	0.26	0.27	0.05	0.07	0.18	0.07	0.12	0.04	0.07	0.07	0.09	0.09	0.12	0.10	0.07
F	0.32	0.36	1.18	1.63	1.64	0.76	1.18	1.20	0.72	1.29	1.59	1.18	1.12	1.27	1.56
Total	93.86	94.76	95.22	94.75	96.04	93.26	95.03	93.22	93.21	93.48	94.04	93.47	95.96	94.22	94.88
Si	5.488	5.475	5.659	5.680	5.659	5.550	5.476	5.578	5.761	5.684	5.579	5.618	5.623	5.679	5.653
Al^{iv}	2.512	2.525	2.341	2.320	2.341	2.450	2.524	2.422	2.239	2.316	2.421	2.382	2.377	2.321	2.347
Cr	0.012	0.008	0.000	0.006	0.000	0.014	0.026	0.006	0.008	0.000	0.006	0.000	0.000	0.000	0.008
Al^{vi}	0.155	0.209	0.690	0.740	0.641	0.610	0.433	0.555	0.654	0.699	0.592	0.820	0.688	0.684	0.747
Ti	0.451	0.426	0.109	0.117	0.101	0.112	0.114	0.099	0.101	0.108	0.103	0.118	0.111	0.114	0.108
Fe^{2+}	2.896	2.876	1.973	1.958	2.020	2.287	2.353	2.200	2.450	2.082	2.223	2.065	2.046	2.054	2.008
Mn	0.013	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	2.330	2.308	3.098	2.994	3.105	3.002	3.166	3.153	2.789	2.940	3.088	2.800	3.030	2.963	2.948
Ca	0.004	0.003	0.000	0.000	0.000	0.010	0.027	0.000	0.007	0.000	0.003	0.000	0.000	0.000	0.000
Na	0.048	0.041	0.110	0.123	0.164	0.101	0.134	0.115	0.104	0.113	0.136	0.145	0.133	0.133	0.133
K	1.602	1.651	1.573	1.572	1.555	1.412	1.436	1.511	1.235	1.614	1.430	1.553	1.555	1.618	1.588
Cl	0.069	0.071	0.014	0.017	0.045	0.019	0.031	0.012	0.018	0.017	0.023	0.023	0.030	0.025	0.019
F	0.160	0.180	0.561	0.779	0.779	0.369	0.573	0.586	0.351	0.630	0.773	0.571	0.527	0.611	0.748
TOTAL	15.512	15.538	15.551	15.509	15.586	15.548	15.688	15.639	15.348	15.556	15.580	15.500	15.563	15.567	15.540
X_{mg}	0.45	0.45	0.61	0.60	0.61	0.57	0.57	0.59	0.53	0.59	0.58	0.58	0.60	0.59	0.59

$X_{Mg} = Mg/(Fe^{2+}+Mg)$

Table 5.9 contd.

Sample	SG-03												
Domain	57 / 1.	58 / 1.	59 / 1.	60 / 1.	62 / 1.	63 / 1.	64 / 1.	67 / 1.	68 / 1.	69 / 1.	70 / 1.	71 / 1.	73 / 1.
SiO_2	37.20	36.79	36.85	36.50	37.15	36.87	36.92	37.29	37.32	37.09	37.04	36.40	34.08
TiO_2	1.15	1.20	1.24	1.28	1.18	1.31	1.29	0.96	0.98	0.97	1.23	1.10	1.24
Al_2O_3	17.04	16.73	16.54	17.09	17.06	16.89	17.22	17.20	17.45	17.08	16.86	15.88	18.22
Cr_2O_3	0.00	0.00	0.00	0.00	0.03	0.06	0.00	0.00	0.00	0.05	0.00	0.08	0.00
FeO	16.58	17.00	17.39	17.88	17.65	16.03	16.35	15.24	15.31	15.97	16.27	16.76	21.05
MnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	12.73	12.76	12.84	12.41	12.80	12.42	12.70	12.75	13.25	12.72	12.74	12.63	10.81
CaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.25	0.00
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na_2O	0.43	0.42	0.71	0.36	0.44	0.54	0.82	0.47	0.43	0.50	0.61	1.35	0.36
K_2O	8.00	7.62	7.87	7.68	7.94	7.87	7.88	8.00	8.23	7.80	7.95	7.05	7.22
Cl	0.02	0.04	0.20	0.05	0.04	0.06	0.15	0.04	0.04	0.03	0.27	0.89	0.04
F	1.34	1.05	1.16	1.44	0.98	1.08	1.28	1.06	1.00	0.99	1.14	0.78	0.42
Total	94.50	93.61	94.79	94.68	95.27	93.14	94.62	93.00	94.00	93.20	94.12	93.16	93.44
Si	5.658	5.640	5.616	5.581	5.612	5.666	5.609	5.706	5.654	5.679	5.649	5.629	5.319
Al^{iv}	2.342	2.360	2.384	2.419	2.388	2.334	2.391	2.294	2.346	2.321	2.351	2.371	2.681
Cr	0.000	0.000	0.000	0.000	0.004	0.008	0.000	0.000	0.000	0.006	0.000	0.010	0.000
Al^{vi}	0.713	0.663	0.586	0.661	0.649	0.724	0.694	0.808	0.769	0.761	0.680	0.522	0.672
Ti	0.132	0.139	0.142	0.147	0.134	0.151	0.148	0.110	0.111	0.111	0.141	0.128	0.146
Fe^{2+}	2.109	2.179	2.217	2.286	2.230	2.060	2.077	1.950	1.940	2.045	2.075	2.167	2.748
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	2.887	2.917	2.917	2.828	2.884	2.846	2.878	2.909	2.993	2.903	2.898	2.911	2.515
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.041	0.000
Na	0.126	0.126	0.210	0.107	0.128	0.162	0.243	0.139	0.127	0.149	0.181	0.405	0.110
K	1.552	1.490	1.529	1.499	1.529	1.543	1.528	1.562	1.590	1.523	1.546	1.390	1.439
Cl	0.005	0.010	0.053	0.013	0.011	0.017	0.039	0.011	0.010	0.008	0.071	0.233	0.009
F	0.645	0.508	0.558	0.697	0.470	0.526	0.616	0.511	0.477	0.481	0.548	0.381	0.208
TOTAL	15.519	15.513	15.601	15.529	15.557	15.495	15.567	15.478	15.531	15.498	15.523	15.573	15.629
X_{mg}	0.58	0.57	0.57	0.55	0.56	0.58	0.58	0.60	0.61	0.59	0.58	0.57	0.48

$X_{Mg} = Mg/(Fe^{2+}+Mg)$

Table 5.10 Chemical analysis and structural formulae (on the basis of 32 Oxygen) of Plagioclase from mafic granulites.

Sample	CH-03									
Domain	71 / 1.	72 / 1.	73 / 1.	74 / 1.	114 / 1.	115 / 1.	116 / 1.	117 / 1.	118 / 1.	119 / 1.
SiO_2	55.68	55.81	54.83	55.77	53.88	53.15	56.82	55.86	50.29	49.96
Al_2O_3	27.14	26.91	27.45	27.34	27.29	29.73	27.09	28.00	31.67	31.75
FeO	0.00	0.46	0.11	0.08	0.15	0.00	0.00	0.00	0.00	0.00
CaO	10.63	10.63	11.54	11.18	11.63	14.09	11.07	11.37	15.57	15.89
Na_2O	5.38	5.18	5.19	5.28	5.71	3.65	5.54	5.15	2.67	2.40
K_2O	0.20	0.29	0.09	0.13	0.59	0.20	0.13	0.15	0.02	0.11
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.04**	**99.29**	**99.21**	**99.78**	**99.26**	**100.82**	**100.65**	**100.53**	**100.22**	**100.11**
Si	10.119	10.137	9.985	10.076	9.881	9.576	10.167	10.015	9.151	9.111
Al	5.813	5.760	5.891	5.821	5.897	6.312	5.712	5.917	6.793	6.823
Fe^{2+}	0.000	0.071	0.016	0.013	0.024	0.000	0.000	0.000	0.000	0.000
Ca	2.070	2.069	2.251	2.164	2.285	2.720	2.121	2.183	3.035	3.105
Na	1.896	1.825	1.832	1.848	2.031	1.275	1.922	1.789	0.942	0.849
K	0.047	0.068	0.021	0.030	0.138	0.045	0.031	0.034	0.004	0.026
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	19.945	19.929	19.997	19.952	20.256	19.928	19.953	19.938	19.925	19.915
An	51.58	52.23	54.84	53.54	51.30	67.32	52.07	54.49	76.24	78.01
Ab	47.26	46.07	44.63	45.73	45.59	31.55	47.17	44.65	23.66	21.34
Or	1.16	1.71	0.52	0.73	3.11	1.12	0.75	0.86	0.10	0.65

Table 5.10 contd.

Sample	CH-06									
Domain	23 / 1.	24 / 1.	25 / 1.	26 / 1.	35 / 1.	36 / 1.	37 / 1.	38 / 1.	57 / 1.	58 / 1.
SiO_2	50.95	52.49	54.89	55.64	56.27	56.31	54.28	56.28	55.01	55.01
Al_2O_3	32.51	30.27	29.24	27.16	26.12	27.01	27.77	27.54	27.80	27.65
FeO	0.12	0.31	0.00	0.01	0.00	0.00	0.32	0.04	0.00	0.00
CaO	10.12	11.51	10.86	11.00	10.31	10.83	9.90	10.42	10.48	10.96
Na_2O	4.74	4.74	5.14	5.12	5.56	5.71	5.42	5.44	5.58	5.43
K_2O	0.73	0.47	0.22	0.19	0.22	0.13	0.48	0.16	0.09	0.11
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.16**	**99.79**	**96.80**	**99.11**	**98.48**	**99.99**	**98.17**	**99.87**	**99.12**	**99.22**
Si	9.297	9.545	9.855	10.107	10.273	10.147	9.978	10.129	10.010	10.003
Al	6.991	6.487	6.187	5.814	5.619	5.736	6.016	5.841	5.962	5.926
Fe^{2+}	0.018	0.047	0.000	0.002	0.000	0.000	0.049	0.005	0.000	0.000
Ca	1.978	2.242	2.090	2.140	2.017	2.090	1.949	2.010	2.043	2.135
Na	1.675	1.672	1.788	1.801	1.966	1.995	1.931	1.897	1.969	1.913
K	0.170	0.108	0.050	0.044	0.052	0.030	0.113	0.036	0.021	0.025
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	20.130	20.101	19.971	19.909	19.927	19.998	20.036	19.917	20.004	20.003
An	51.73	55.75	53.20	53.69	49.98	50.79	48.82	50.98	50.66	52.42
Ab	43.83	41.56	45.52	45.20	48.73	48.48	48.35	48.11	48.83	46.96
Or	4.44	2.69	1.28	1.11	1.29	0.73	2.82	0.90	0.51	0.62

Table 5.10 contd.

Sample	N-14											
Domain	69 / 1.	70 / 1.	120 / 1.	121 / 1.	122 / 1.	123 / 1.	124 / 1.	125 / 1.	161 / 1.	162 / 1.	163 / 1.	164 / 1.
SiO_2	53.62	56.36	53.24	57.83	55.55	54.30	56.01	53.60	54.37	54.41	55.29	55.63
Al_2O_3	29.26	27.21	32.04	25.26	26.94	27.66	27.48	28.99	27.56	27.35	27.83	27.81
FeO	0.02	0.08	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.08
CaO	10.93	11.13	9.80	6.17	11.27	12.32	11.49	12.97	10.98	11.24	11.42	11.41
Na_2O	5.21	5.19	4.87	1.54	4.58	4.58	5.38	4.08	5.33	5.26	5.10	5.07
K_2O	0.23	0.22	0.41	8.83	0.82	0.32	0.11	0.19	0.10	0.09	0.11	0.11
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.27**	**100.20**	**100.70**	**99.63**	**99.16**	**99.19**	**100.47**	**99.84**	**98.46**	**98.65**	**99.80**	**100.11**
Si	9.756	10.133	9.524	10.633	10.114	9.910	10.058	9.721	9.973	9.985	9.992	10.018
Al	6.273	5.765	6.754	5.473	5.781	5.950	5.816	6.197	5.957	5.915	5.927	5.902
Fe^{2+}	0.004	0.013	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.012
Ca	2.130	2.145	1.879	1.215	2.198	2.408	2.211	2.521	2.158	2.211	2.210	2.202
Na	1.838	1.809	1.690	0.549	1.617	1.621	1.872	1.436	1.896	1.870	1.787	1.768
K	0.053	0.051	0.093	2.070	0.191	0.075	0.025	0.045	0.024	0.021	0.025	0.026
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	20.053	19.915	19.991	19.940	19.900	19.964	19.983	19.920	20.009	20.002	19.950	19.928
An	52.97	53.55	51.30	31.68	54.87	58.68	53.81	63.00	52.92	53.90	54.96	55.09
Ab	45.72	45.17	46.16	14.32	40.37	39.50	45.57	35.88	46.48	45.59	44.43	44.25
Or	1.31	1.28	2.55	54.00	4.76	1.82	0.62	1.12	0.60	0.52	0.61	0.66

Table 5.10 contd.

Sample	BG-04										
Domain	180 / 1.	183 / 1.	184 / 1.	185 / 1.	186 / 1.	195 / 1.	196 / 1.	31 / 1.	32 / 1.	33 / 1.	34 / 1.
SiO_2	55.25	57.01	55.99	54.27	55.87	56.10	55.26	54.85	56.49	56.23	56.71
Al_2O_3	29.07	27.42	27.83	28.66	27.46	27.28	27.96	28.05	27.74	27.31	27.87
FeO	0.26	0.02	0.00	0.00	0.07	0.00	0.00	0.11	0.07	0.08	0.08
CaO	11.49	10.63	10.89	11.91	10.89	11.47	10.76	11.10	12.07	11.11	11.16
Na_2O	4.70	5.32	5.29	4.69	5.39	5.14	5.48	4.99	4.38	4.97	5.40
K_2O	0.15	0.07	0.11	0.08	0.09	0.10	0.09	0.34	0.39	0.13	0.28
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**100.92**	**100.46**	**100.12**	**99.60**	**99.77**	**100.09**	**99.55**	**99.43**	**101.14**	**99.83**	**101.50**
Si	9.873	10.187	10.063	9.836	10.084	10.099	9.999	9.955	10.071	10.131	10.075
Al	6.122	5.773	5.895	6.122	5.841	5.788	5.962	6.000	5.828	5.799	5.834
Fe^{2+}	0.039	0.004	0.000	0.000	0.011	0.000	0.000	0.016	0.010	0.012	0.012
Ca	2.200	2.034	2.097	2.312	2.106	2.212	2.087	2.158	2.305	2.144	2.125
Na	1.627	1.843	1.844	1.648	1.885	1.794	1.921	1.754	1.515	1.737	1.859
K	0.035	0.015	0.026	0.018	0.021	0.023	0.021	0.079	0.088	0.029	0.064
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	19.896	19.855	19.925	19.935	19.948	19.916	19.991	19.962	19.817	19.852	19.969
An	56.97	52.27	52.87	58.12	52.50	54.90	51.79	54.07	58.98	54.83	52.49
Ab	42.13	47.34	46.48	41.43	46.98	44.53	47.69	43.96	38.76	44.42	45.94
Or	0.90	0.39	0.65	0.44	0.52	0.57	0.52	1.97	2.26	0.75	1.57

Table 5.11 Chemical analysis and structural formulae (on the basis of 10 Oxygen) of Sillimanite from pelitic granulites.

Sample	**BK-5**											
Domain	**23/1.**	**24/1.**	**25/1.**	**25/1.**	**26/1.**	**27/1.**	**28/1.**	**29/1.**	**30/1.**	**31/1.**	**32/1.**	**35/1.**
SiO_2	37.29	38.42	38.59	37.83	38.11	38.64	37.95	38.55	37.21	37.26	38.88	39.03
TiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	61.65	62.53	61.96	61.53	61.33	62.51	61.79	61.93	61.49	62.21	62.38	61.19
Cr_2O_3	0.019	0.028	0.029	0.032	0.049	0.022	0.016	0.015	0.036	0.031	0.021	0.014
FeO	0.31	0.38	0.52	0.49	0.62	0.59	0.42	0.66	0.59	0.61	0.55	0.45
Total	**99.27**	**101.36**	**101.10**	**99.88**	**100.11**	**101.76**	**100.18**	**101.16**	**99.33**	**100.11**	**101.83**	**100.68**
Si	2.028	2.046	2.061	2.046	2.057	2.052	2.045	2.059	2.026	2.013	2.062	2.091
Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	3.953	3.926	3.902	3.923	3.903	3.913	3.926	3.900	3.946	3.963	3.900	3.865
Cr	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Fe^{2+}	0.014	0.017	0.023	0.022	0.028	0.026	0.019	0.029	0.027	0.028	0.024	0.020
Total	5.995	5.990	5.987	5.992	5.990	5.992	5.991	5.990	6.000	6.005	5.987	5.976