V436B

Garnet	Core				Rim
SiO2	36.38	36.52	37.39	37.74	36.89
Al2O3	19.83	20.05	20.80	21.47	20.52
TiO2	0.00	0.09	0.05	0.03	0.09
FeO	30.46	30.99	34.33	39.04	34.94
MnO	7.06	5.77	0.34	0.10	0.29
MgO	0.82	0.88	2.46	2.52	3.04
CaO	3.14	3.95	4.15	1.72	3.33
Total	97.7	98.3	99.5	102.6	99.1
Almandine	70.69	71.29	77.38	85.17	77.81
Grossular	9.32	11.65	11.97	4.81	9.49
Pyrope	3.39	3.63	9.87	9.80	12.05
Spessartine	16.60	13.44	0.78	0.22	0.65
Fe/(Fe+Mg)	0.95	0.95	0.89	0.90	0.87
Fe/(Fe+Mg+Mn)	0.78	0.81	0.88	0.89	0.86
Mn/(Fe+Mg+Mn)	0.18	0.15	0.01	0.00	0.01

Biotite	(M)	**Muscovite**	(M)
SiO2	37.18	SiO2	46.46
Al2O3	18.83	Al2O3	32.96
TiO2	1.42	TiO2	0.40
FeO	17.81	FeO	1.15
MnO	0.00	MnO	0.00
MgO	12.37	MgO	1.53
CaO	0.03	CaO	0.01
Na2O	0.28	Na2O	1.68
K2O	8.36	K2O	9.48
Total	96.28	Total	
Fe/(Fe+Mg)	0.447	musc	0.787
Fe/(Fe+Mg+Mn)	0.447	para	0.212
East	0.133	cel	0.119
		Fe/(Fe+Mg)	0.297

Table 1. V436B representative microprobe analyses for garnet, muscovite and biotite. Garnet values are for traverse of porphyroblast in figure 2. (I) in the-head ing of an analysis denotes that the grain is an inclusion in garnet. (M) denotes that the mineral grain analyzed is in the matrix.

V436A

Garnet	Core			Rim	Stringer
SiO2	37.04	36.81	36.53	35.88	36.55
Al2O3	20.53	20.78	20.27	19.67	20.60
TiO2	0.00	0.00	0.00	0.00	0.00
FeO	37.42	40.17	40.52	40.68	42.36
MnO	2.40	1.00	0.10	0.14	0.15
MgO	2.40	2.61	2.11	1.82	1.82
CaO	1.77	0.53	0.47	0.48	0.34
Total	101.5	101.9	100.0	98.7	101.8
Almandine	80.66	86.37	90.07	91.03	91.69
Grossular	4.87	1.47	1.35	1.37	0.94
Pyrope	9.22	9.99	8.36	7.27	7.04
Spessartine	5.24	2.17	0.23	0.32	0.34
Fe/(Fe+Mg)	0.90	0.90	0.92	0.93	0.93

Muscovite	(M)	Strain Shadow	Biotite	(M)	(M)
SiO2	45.41	45.78	SiO2	34.75	34.18
Al2O3	32.46	32.21	Al2O3	17.56	17.00
TiO2	0.47	0.34	TiO2	1.86	2.73
FeO	2.21	2.71	FeO	25.31	25.59
MnO	0.03	0.04	MnO	0.02	0.00
MgO	1.20	1.23	MgO	6.89	6.71
CaO	0.24	0.00	CaO	0.09	0.17
Na2O	1.28	1.44	Na2O	0.38	0.44
K2O	8.85	8.98	K2O	8.52	8.07
Total	92.15	92.71	Total	95.36	94.88
x musc	0.804	0.804	xFe	0.570	0.580
x para	0.177	0.196	xMg	0.277	0.271
xAl	0.864	0.853	xTi	0.038	0.056
xphen	0.123	0.137	xAl	0.115	0.093

Table 2. V436A representative microprobe analyses for garnet, muscovite and biotite. (I) in the heading of an analysis denotes that the grain is an inclusion in garnet. (M) denotes that the mineral grain analyzed is in the matrix.

V261A

Plagioclase	Core (I)	(I)	(I)	Rim (I)	Matrix
SiO2	63.89	64.66	64.55	66.30	67.28
Al2O3	21.87	22.15	21.58	21.38	21.08
TiO2	0.04	0.09	0.11	0.05	0.02
FeO	0.21	0.27	0.72	0.12	0.22
MnO	0.05	0.06	0.18	0.05	0.06
MgO	0.00	0.24	0.04	0.08	0.18
CaO	4.19	3.92	3.54	2.79	2.52
Na2O	9.62	8.45	8.02	8.71	8.77
K2O	0.03	0.02	0.11	0.01	0.06
Total	99.95	99.91	98.89	99.52	100.22
Mole% Ab	80.50	79.47	79.79	84.90	85.96
Mole% An	19.35	20.38	19.47	15.05	13.64
Mole% Or	0.15	0.14	0.74	0.04	0.41

GARNET	Core				Rim
SiO2	37.29	37.96	36.51	37.36	37.96
Al2O3	20.07	20.56	20.10	20.05	20.82
TiO2	0.02	0.05	0.13	0.08	0.01
FeO	25.30	26.48	27.67	31.19	31.69
MnO	8.54	6.90	5.51	4.35	0.30
MgO	1.43	1.68	1.35	1.86	3.44
CaO	6.38	6.59	6.27	5.78	5.49
Total	99.01	100.22	97.71	100.78	99.70
Almandine	56.64	58.98	63.3	67.3	70.19
Grossular	18.29	18.80	18.4	16.0	15.57
Pyrope	5.69	6.66	5.51	7.17	13.57
Spessartine	19.37	15.56	12.77	9.50	0.67
Fe/(Fe+Mg)	0.91	0.90	0.92	0.90	0.84
Fe/(Fe+Mg+Mn)	0.69	0.73	0.78	0.80	0.83

Table 3. V261 representative microprobe data for plagioclase, garnet, muscovite and biotite. Garnet and plagioclase data are from a traverse across the porphyroblast shown in figure 4. (I) in the heading of an analysis denotes that the grain is an inclusion in garnet. (M) denotes that the mineral grain analyzed is in the matrix.

V261A

Biotite	(M)	(M)	(M)	(M)	Ave.
SiO2	37.69	36.85	37.10	38.30	37.49
Al2O3	17.42	17.20	17.67	17.96	17.56
TiO2	1.37	1.29	1.59	1.73	1.49
FeO	19.87	19.76	19.77	18.97	19.59
MnO	0.08	0.10	0.08	0.14	0.10
MgO	10.81	11.04	11.41	11.83	11.27
CaO	0.06	0.13	0.09	0.13	0.10
Na2O	0.13	0.34	0.12	0.67	0.31
K2O	8.75	9.17	8.45	8.75	8.78
Total	96.27	95.89	96.29	98.51	96.70
Fe/(Fe+Mg)	0.508	0.501	0.493	0.474	0.501
Mg/(Mg+Fe)	0.492	0.499	0.507	0.526	0.499
east	0.125	0.111	0.113	0.116	0.111

MUSCOVITE	(M)	(M)	(M)	(M)	Ave.
SiO2	46.60	46.32	47.29	46.74	46.74
Al2O3	30.27	31.51	31.40	31.59	31.19
TiO2	0.30	0.37	0.58	0.63	0.47
FeO	3.28	3.24	2.72	4.23	3.37
MnO	0.00	0.09	0.02	0.00	0.03
MgO	1.31	1.19	1.17	1.28	1.24
CaO	0.16	0.02	0.08	0.08	0.09
Na2O	1.09	1.17	0.96	1.23	1.11
K2O	8.55	9.10	8.83	8.37	8.71
Total	91.62	93.04	93.09	94.19	92.98
x musc	0.826	0.835	0.852	0.811	0.831
x para	0.161	0.163	0.141	0.182	0.162
xAl	0.833	0.838	0.851	0.808	0.832
Phengite	0.159	0.152	0.135	0.177	0.156

Table 3. continued.

V257

Plagioclase	(I)	(I)	(I)	(M)	(M)
SiO2	65.20	66.49	65.77	66.95	67.62
Al2O3	22.52	21.88	21.62	21.65	20.98
TiO2	0.13	0.00	0.08	0.17	0.00
FeO	0.26	0.04	0.11	0.00	0.00
MnO	0.00	0.23	0.01	0.03	0.07
MgO	0.30	0.24	0.00	0.30	0.39
CaO	3.80	3.50	3.37	3.45	2.60
Na2O	8.52	8.46	8.83	9.43	9.45
K2O	0.11	0.05	0.09	0.00	0.00
Total	100.84	100.89	98.79	101.98	101.11
Mole% Ab	79.68	81.14	82.11	83.18	86.80
Mole% An	19.64	18.55	17.34	16.82	13.20
Mole% Or	0.68	0.32	0.55	0.00	0.00

Garnet	Core				Rim
SiO2	38.17	38.22	38.15	38.56	38.66
Al2O3	20.96	20.95	20.90	21.02	20.93
TiO2	0.16	0.21	0.16	0.06	0.05
FeO	27.98	30.00	30.26	31.22	31.43
MnO	3.77	2.97	1.40	0.71	0.19
MgO	2.15	1.68	1.74	2.37	3.55
CaO	6.83	6.97	7.56	7.50	5.92
Total	100.03	100.99	100.18	101.44	100.73
Almandine	63.04	66.78	68.04	68.21	69.02
Grossular	19.73	19.87	21.79	20.98	16.66
Pyrope	8.62	6.65	6.97	9.24	13.90
Spessartine	8.61	6.69	3.20	1.56	0.42
Fe/(Fe+Mg)	0.880	0.909	0.907	0.881	0.832

Table 4. V257 representative microprobe data for plagioclase, garnet, muscovite, biotite and epidote. Garnet and plagioclase data are from a traverse across the porphyroblast shown in figure 5. (I) in the heading of an analysis denotes that the grain is an inclusion in garnet. (M) denotes that the mineral grain analyzed is in the matrix.

Epidote	(I)	(I)	(I)	(I)	(I)
SiO2	39.76	39.54	39.46	39.95	40.07
TiO2	0.04	0.13	0.10	0.04	0.05
Al2O3	24.95	24.55	24.77	24.74	25.37
Fe2O3	11.53	12.65	11.81	11.96	11.25
FeO	0.47	0.11	0.28	0.23	0.22
MnO	0.19	0.38	0.18	0.21	0.32
MgO	0.25	0.08	0.42	0.31	0.36
CaO	23.28	22.23	22.83	23.16	22.81
Total	100.82	99.81	100.06	100.67	100.56

Muscovite	(I)	(M)	**Biotite**	(M)
SiO2	48.64	48.51	SiO2	38.20
Al2O3	31.18	31.80	Al2O3	17.51
TiO2	0.87	0.61	TiO2	1.69
FeO	3.01	2.12	FeO	18.44
MnO	0.04	0.03	MnO	0.06
MgO	1.72	1.55	MgO	12.03
CaO	0.06	0.09	CaO	0.13
Na2O	0.85	1.33	Na2O	0.16
K2O	10.08	9.26	K2O	9.10
Total	96.45	95.31	Total	97.31
x-musc	0.883	0.816	xTi	0.033
x-para	0.113	0.178	xAl	0.115
x-phen	0.165	0.135	Fe/(Fe+Mg)	0.462
			Mg/(Mg+Fe)	0.538

Table 4. continued.

Weight % oxide

	V240	V634A	V 257	V 261A	V 436A	V 436B	V653-s	V653-q	ave pelite
SiO2	54.60	61.70	65.73	74.11	73.80	58.19	72.80	89.40	59.77
Al2O3	25.10	22.50	15.54	12.21	12.10	21.77	15.30	4.83	16.57
FeO	8.64	7.51	6.10	4.19	7.91	7.72	4.98	2.71	5.88
MnO	0.12	0.13	0.09	0.10	0.10	0.17	0.11	0.01	0.07
MgO	1.76	1.00	2.14	1.68	0.64	1.78	0.47	0.36	2.62
CaO	0.65	0.43	1.47	0.68	0.16	0.55	0.16	0.08	2.17
Na2O	1.86	0.90	2.29	1.30	0.45	0.80	0.87	0.34	1.73
K2O	3.35	3.99	2.88	2.78	2.39	4.96	2.96	0.96	3.53
P205	0.2	0.32	0.17	0.14	0.07	0.16	0.05	0.03	N/A
SUM	96.28	98.48	96.41	97.19	97.62	96.10	97.70	98.72	92.34

molecular basis

	V240	V634A	V 257	V 261A	V 436A	V 436B	V653-s	V653-q	ave pelite
SiO2	65.02	71.15	73.95	81.29	81.35	68.62	81.18	93.04	70.59
Al2O3	17.61	15.29	10.30	7.89	7.86	15.13	10.05	2.96	11.53
FeO	8.60	7.24	5.74	3.85	7.29	7.62	4.64	2.36	5.81
MnO	0.12	0.13	0.09	0.09	0.09	0.17	0.10	0.01	0.07
MgO	3.12	1.72	3.59	2.75	1.05	3.13	0.78	0.56	4.61
CaO	0.83	0.53	1.77	0.80	0.19	0.69	0.19	0.09	2.75
Na2O	2.15	1.01	2.50	1.38	0.48	0.91	0.94	0.34	1.98
K2O	2.54	2.93	2.07	1.95	1.68	3.73	2.11	0.64	2.66
SUM	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

molecular basis minus SiO2

	V240	V634A	V 257	V 261A	V 436A	V 436B	V653-s	V653-q	ave pelite
Al2O3	50.35	53.00	39.54	42.19	42.15	48.20	53.42	42.57	39.21
FeO	24.59	25.10	22.04	20.57	39.10	24.27	24.68	33.90	19.75
MnO	0.35	0.44	0.33	0.50	0.50	0.54	0.55	0.13	0.24
MgO	8.93	5.96	13.78	14.69	5.64	9.97	4.15	8.03	15.69
CaO	2.37	1.84	6.80	4.27	1.01	2.21	1.02	1.28	9.34
Na2O	6.14	3.49	9.59	7.39	2.58	2.91	5.00	4.93	6.74
K2O	7.27	10.17	7.93	10.40	9.01	11.89	11.19	9.16	9.04
SUM	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	V240	V634A	V 257	V 261A	V 436A	V 436B	V653-s	V653-q	ave pelite
Fe/Fe+Mg	0.73	0.81	0.62	0.58	0.87	0.71	0.86	0.81	0.56
A/FM	0.37	0.36	-0.02	-0.02	0.20	0.18	0.32	0.17	-0.13

Table 5. Bulk rock XRF analyses used to construct P-T pseudosections. A/FM = (Al203-3K2O)/(Al203-3K2O+FeO+MgO).

V634A

Position	FIA	End-members	Temperature	Pressure
Garnet core	2	Py, alm, spss mu, cel, mctd fctd, mnctd, clin, daph, ames,q , H2O	554 ± 27°C	9.5 ± 3.6 kb
Garnet median	3	Py, alm, mu, cel, mst, fst, mctd, fctd, q, H2O	610 ± 25°C	13.6 ± 2.6 kb
Garnet rim/matrix	4	Py, alm, mu, cel, phl, ann, east clin, daph, ames, mst, fst, q, H2O	580 ± 16°C	5.6 ± 2.2 kb

V240

Position	FIA	End-members	Temperature	Pressure
Garnet core	2	Py, gr, alm, spss, mu, cel, ma, mctd, fctd, mnctd, mst, fst, ky, q, H2O	580 ± 11°C	11.2 ± 1.3 kb
Garnet resorption	2	Py, gr, alm, spss, mu, cel ma, mctd, fctd, mnctd, mst, fst, ky, q H2O	550 ± 15°C	9.8 ± 2.0 kb
Garnet rim	3	Py, gr, alm, mu, cel, ma, mctd, fctd, mst, fst, clin, daph, ames, q, H2O	584 ± 12°C	12.8 ± 1.5 kb
Garnet rim/matrix	4	Py, alm, mu, cel, phl, ann, east, mst, fst, clin, daph, ames, q, H2O	593 ± 22°C	6.6 ± 2.6 kb

V653

Position	FIA	End-members	Temperature	Pressure
V653-1	3	mctd fctd py gr alm spss mu cel phl ann east mst fst clin daph ames ky q H2O	558 ± 11°C	9.3 ± 1.8 kb

V261A

Position	FIA	End-members	Temperature	Pressure
Garn core 1	1	py gr alm an ab phl ann east mu pa cel q H2O	562 ± 31°C	8.3 ± 1.2 kb
Garn core 2	1	py gr alm an ab phl ann east mu pa cel q H2O	576 ± 28°C	8.8 ± 1.1 kb
Garn median	1	py gr alm an ab phl ann east mu pa cel q H2O	583 ± 36°C	8.6 ± 1.4 kb
Garn rim	3	py gr alm an ab phl ann east mu pa cel q H2O	623 ± 39°C	12.6 ± 1.7 kb
Garn rim Matrix plag	3	py gr alm an ab phl ann east mu pa cel q H2O	649 ± 27°C	11.6 ± 1.2 kb

V257

Position	FIA	End-members	Temperature	Pressure
Garn core	1	py gr alm mu pa cz an ab phl ann east q H2O	564 ± 28°C	9.3 ± 1.0 kb
Garn rim	3	py gr alm mu pa an ab phl ann east q H2O	637 ± 28°C	12.0 ± 1.2 kb

V436B

Position	FIA	End-members	Temperature	Pressure
Garn rim 1 high Ca	3	py alm mu cel phl ann east q H2O	512 ± 92°C	11.9 ± 1.9 kb
Garn rim 2 low Ca	3	py alm mu cel phl ann east q H2O	544 ± 86°C	12.1 ± 1.9 kb

V436A

Position	FIA	End-members	Temperature	Pressure
Garn rim	3	py alm mu cel phl ann east q H2O	599 ± 100°C	12.7 ± 2.0 kb

Intersecting isopleths

V261 core	F(g)xC(g)	526 ± 8°C	7.0 ± 0.3 kbars
	M(g)xC(g)	525 ± 8°C	6.9 ± 0.2 kbars
	F(g)xM(g)	526 ± 8°C	6.9 ± 0.3 kbars
V257 core	F(g)xC(g)	533 ± 9°C	6.9 ± 0.3 kbars
	M(g)xC(g)	539 ± 9°C	7.1 ± 0.3 kbars
	F(g)xM(g)	533 ± 9°C	6.9 ± 0.3 kbars
V436B core	F(g)xC(g)	526 ± 10°C	4.6 ± 0.3 kbars
	M(g)xC(g)	524 ± 9°C	4.5 ± 0.3 kbars
	F(g)xM(g)	525 ± 10°C	4.0 ± 0.2 kbars
V436A core	F(g)xC(g)	513 ± 11°C	3.4 ± 0.3 kbars
	M(g)xC(g)	528 ± 10°C	4.0 ± 0.4 kbars
	F(g)xM(g)	516 ± 9°C	7.0 ± 0.6 kbars

Table 6. Summary of thermobarometric estimates for region surrounding Chester and Athens Dome. Samples V240 and V634A are high-Al pelites discussed in Chapter 3 of this thesis. Temperature and pressure with associated errors are listed along with microstructural relationship and end-members used in the calculations for average P-T results. Temperature and pressure results with associated errors for the intersecting isopleths are listed for the three independent intersections for garnet core compositions for the 4 samples discussed in detail. All or the results are reported at the 2-sigma confidence level.