from a rhyodacite flow and 4 different specimens from a granodiorite have been conducted in order to determine the variability of garnet composition in a particular host rock. The specimens were prepared as grain mounts. Finally, analyses of 12 different garnets were obtained from different host rocks and localities spread over several thousand square miles in Victoria. The localities are summarized in Table 1. In order to determine whether there is any relation between host rock chemistry and the composition of the garnet, partial analyses of 7 host rocks have been conducted, and the garnet composition compared with the composition of the respective host rocks.

Table 1. *Details of specimen localities from which the garnet-bearing calc-alkaline rocks were obtained. The numbers refer to the catalogue in the Department of Geophysics, A.N.U. Specimens 2001, 2043—2047 were collected by one of the authors (A.E.R.). Specimens 2048—2056 were supplied by Dr.* I. McDougall

Specimen Number	Rock name and details of location
2001, 2045—2047	granodiorite from Deddick
2043	quartz-biotite rhyodacite from Black Spur, 6 miles north-east of Healesville on the Healesville-Marysville Road
2044	quartz-biotite rhyodacite from 9.1 miles east of Marysville.
2048	rhyodacite from 5.65 miles east of Taggerty along the Blue Range Road
2049	rhyodacite from Lake Mountain Road Grid reference 878E, 735N Juliet B, 840B Zone 7
2050	rhyodacite from Lake Mountain Road, 2 miles north of junction with Marysville-Woods Point Road
2051	rhyodacite from Lake Mountain Road, 1.3 miles from turnoff at Bellel
2052	rhyodacite from Black Spur on the Maroondah Highway between Dom Dom Saddle and Bladin's Quarry
2053	rhyodacite from near Toombullup, 3 miles from Holland's Creek Crossing
2054	granodiorite porphyrite 5 miles north of Tolmie on Mad House Road
2055	ring-dyke granodiorite porphyrite on Eildon-Jamieson Road south of Rocky Ridge, Jamieson Map Sheet 402.2E, 390.3N.
2056	ring-dyke granodiorite porphyrite from 300 yards east of 2055

(2) A natural garnet-bearing rhyodacite (rhyodacite II) from Victoria has been finely ground, melted and quenched to a glass. This glass has then been subjected to a series of experiments in a piston-cylinder high pressure and high temperature apparatus. The experimental techniques have been described in detail in other papers; a pressure correction of −10% has been applied (D. H. Green and Ringwood, 1967; T. H. Green, Ringwood and Major, 1966). Approximately 20 mgm. of powdered rhyodacite II glass were packed into graphite sample capsules and about 1 mgm. of water added. Melting experiments have been conducted at 9, 13.5, 18 and 27 kb in order to determine the sequence of mineralogical changes, particularly the stability field of garnet, in the rhyodacite II composition with increasing pressure. The P_{H_2O} in the unsealed graphite capsules is not controlled, but is less than P_{LOAD} and probably of the order of 2—5 kb. After the experimental runs the sample has been examined optically and by X-ray means, and where possible polished thin sections have been prepared to enable analysis of crystal phases (garnet) using the electron microprobe. The analytical techniques are similar to those described in the previous section.

Results

1. Analyses of Natural Garnets

Electron microprobe traverses across a total of 11 garnet phenocrysts from 4 different polished thin sections revealed that the crystals are quite uniform in composition except for a marginal zone 10—40 μ wide which is slightly richer in almandine-spessartine and poorer in pyrope than the rest of the crystal. This is illustrated by the analyses of central and edge regions of garnets given in Table 2. Only one crystal does not show any zoning. The reaction rims around the garnets consist of iron-rich cordierite and hypersthene (e.g. approximate analysis: cordierite 8.4—9.6% FeO, 6.7—8.0% MgO; hypersthene 33.4—35.0% FeO, 12.1—14.1% MgO).

Table 2. *Analyses of 4 garnet specimens prepared as polished thin sections in order to determine the amount of variation in composition across garnet crystals occurring in the Palaeozoic acid calc-alkaline igneous rocks of Victoria*

Specimen	2043 (c) centre	2043 (c) edge	2043 (d) centre and edge (no difference)	2044 (a) centre	2044 (a) edge	2044 (d) centre	2044 (d) edge
No. of analyses	23	9	20	66	31	21	12
SiO_2	38.4[a]	38.1[a]	38.6[a]	37.0[a]	37.1[a]	38.5[a]	38.9[a]
TiO_2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Al_2O_3	21.7	21.5	21.8	21.7	21.6	21.7	21.5
FeO	32.3_5	33.2	32.5	31.2	32.2	33.3	35.0
MnO	1.5_5	1.8	1.5	1.6	2.5	1.3	2.5
MgO	5.5_5	4.8	5.6	5.2	4.3	5.3	3.9
CaO	1.7	1.6	1.7	1.6	1.6	1.7	1.6
	101.45	101.2	101.9	98.5	99.5	102.0	103.6
Mol. prop.							
Ti-And	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Gross	3.8	3.7	3.8	3.8	3.8	3.8	3.6
Pyrope	21.6	18.7	21.6	21.1	17.2	20.5	14.9
Alm	70.4	72.8	70.5	70.6	72.5	72.1	75.3
Spess	3.4	4.0	3.3	3.7	5.7	2.8	5.4
No. of different crystals analyzed in mount	2	2	1	6	6	2	2

[a] Denotes calculated content.

Analyses of 9 different specimens of garnet from one rhyodacite flow, and 4 different garnet specimens from a granodiorite are given in Tables 3 and 4 respectively. The garnets from the rhyodacite are quite uniform in composition, showing no more variation than the composition change observed from the centre to the edge of the crystals examined for zoning (see Table 2). Three of the four garnets from the granodiorite agree closely in composition, but the fourth is significantly different (2045). This fourth garnet occurred in the centre of a large ferromagnesian-rich segregation (5 cms in size) in the granodiorite, while the other three garnets occurred as phenocrysts 0.2—1 cm in size surrounded by a ferromagnesian rim usually about 0.5 cms wide.

Analyses of 12 different garnets from different calc-alkaline host rocks from Victoria are given in Table 5. The specimens were obtained from localities up to 170 miles apart, covering an area of several thousand square miles. Examination