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APPENDIX 1

Optical and Analytical Methods

The majority of the refractive indices quoted herein were measured on grains plucked from thin sections, which were immersed in a series of graduated Cargille oils, with mixing of oils of adjacent refractive index to achieve the final match. The refractive index of the oil was then measured using an Abbe refractometer. Garnet and spinel were measured using oils of a Cargille high refractive index set, and the matching oil measured using a Leitz-Jelley refractometer.

All chemical analyses were carried out using largely classical wet chemical techniques. Four sample portions were used for the determination of the major elements. The elements determined and the procedure for each of these portions is given below:

(1) A portion was fused with Na_2CO_3, the fused rock dissolved and SiO_2 filtered off and determined gravimetrically. The R_2O_3 group was then precipitated from the filtrate from above using NH_4OH under carefully controlled pH conditions. The R_2O_3 group was then filtered off and determined gravimetrically. CaO was then

precipitated from the filtrate using NH_4COOH, the $Ca(COOH)_2$ precipitate filtered off, then ignited and converted to CaO, which was determined gravimetrically. MgO was precipitated from the filtrate from the above step as $Mg_2P_2O_7$ and also determined gravimetrically.

(2) A second portion of the sample was dissolved in a mixture of HF and H_2SO_4, and the dissolved sample transferred to volumetric flasks. Using these solutions, Na_2O and K_2O were determined using a flame photometer, and TiO_2, P_2O_5 and MnO determined colorimetrically.

(3) FeO was determined titrimetrically on a third portion using standardised ceric sulphate. This determination was duplicated in all analyses. Total iron was then determined as FeO by the same method after passing the above solution through a silver reductor column.

(4) H_2O^+ was determined on a fourth portion by a modified Penfield tube method using a detachable coiled glass condenser with ground stoppers. H_2O^- was measured using glass weighing bottles with ground glass stoppers.

All the analyses performed have reasonable totals. Of the metabasalts analysed, MB2 has a high total (100.81) and this is probably the result of analytical error. Al_2O_3 is determined by subtraction from

the R_2O_3 group of other independently determined elements, and it is notable that MB2 has significantly more Al_2O_3 than the remainder so this is probably the source of this error.

APPENDIX 2

X-Ray Powder Data

X-RAY POWDER DATA - GARNETS

N	G1 S9657	G2 S5111	G3 S9773	G4 S9674	G5 S9789	S5123	Granodiorite S9408	Pegmatite	Garnet-Grunerite Rock S9923	S9565
12				3.337					3.334	
16	2.887	2.887	2.890	2.885	2.882	2.887	2.885	2.885	2.902	2.978
20	2.584	2.583	2.584	2.583	2.578	2.582	2.579	2.581	2.594	2.669
22	2.461	2.457	2.458	2.457	2.458	2.458	2.454	2.461		2.541
24	2.358	2.358	2.358	2.356	2.353	2.354	2.354	2.353	2.368	2.436
26	2.266	2.262	2.262	2.263	2.260	2.262	2.263	2.263	2.275	2.341
30	2.109	2.109	2.109	2.106		2.108	2.102	2.106	2.120	2.178
32	2.037	2.040		2.040	2.037					
38	1.8745	1.8733	1.8751	1.8897	1.8697	1.8727	1.8715	1.8715	1.8842	1.9351
48	1.6679	1.6665	1.6675	1.6675	1.6633	1.6670	1.6652	1.6665	1.6767	1.7217
52	1.6024	1.6016	1.6024	1.6016	1.5991	1.6029	1.5995	1.6016	1.6100	1.6561
56	1.5444	1.5441	1.5444	1.5426	1.5410	1.5441	1.5418	1.5426	1.5509	1.5954
64	1.4448	1.4422	1.4448	1.4438	1.4422	1.4438	1.4422	1.4435	1.4519	1.4914
80	1.2928	1.2928	1.2932	1.2921	1.2911	1.2937	1.2902	1.2921	1.2987	1.3360
84	1.2621	1.2610	1.2619	1.2614	1.2599	1.2616	1.2582	1.2601	1.2676	1.3032
	1.2321	1.2325	1.2349	1.2323	1.2304	1.2319		1.2317	1.2388	
100		1.1680		1.1661						
104				1.1337						
116	1.0750	1.0747	1.0751	1.0740	1.0737	1.0739	1.0732	1.0731	1.0785	1.1087
120	1.0570	1.0509	1.0570	1.0559	1.0556	1.0556	1.0548	1.0546	1.0602	1.0893
128	1.0234	1.0231	1.0238	1.0226	1.0222	1.0228	1.0217	1.0214	1.0267	1.0553
144		0.9646		0.9644	0.9637			0.9631		
148		0.9513		0.9510	0.9508			0.9504		
152	0.9393	0.9388	0.9395	0.9382	0.9381	0.9388	0.9375	0.0378	0.9433	0.9687
aÅ	11.581	11.575	11.586	11.568	11.566	11.574	11.559	11.562	11.638	11.950

X-RAY POWDER DATA - PUMPELLYITE

S9575		S9596	
dÅ	I/I_1	dÅ	I/I_1
7.06	20	7.03	40
4.68	30	4.68	50
4.38	10		
3.995	10		
3.790	30	3.751	20
3.513	10	3.524	20
3.339	10	3.330	20
3.215	10		
2.896	100	2.899	100
2.814	10		
2.734	20		
2.633	20		
2.510	30		
2.450	30	2.435	40
2.332	10		
2.206	10		
2.119	10		
2.007	10	2.002	10
1.8483	20		
1.5964	10	1.5893	10
		1.5424	10
1.4849	20		10
		1.4788	10
		1.2995	10

X-RAY POWDER DATA -

Opaque Mineral Phase of the Granodiorite

Opaque Phase		Ilmenite*		Pyrrhotite*	
dÅ	I/I_1	dÅ	I/I_1	dÅ	I/I_1
3.74	30	3.73	50		
2.98	30			2.97	33
2.75	90	2.74	100		
2.70	5	?		?	
2.65	50			2.65	33
2.55	40	2.54	85		
2.42	10	?		?	
2.24	10	2.23	70		
2.07	100			2.06	100
1.868	20	1.86	85		
1.725	60	1.72	100	1.71	33
1.632	20	1.63	50		
1.506	10	1.50	85		
1.469	10	1.47	85		