

Variability of garnet in granites.

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IN extending earlier work on the distribution and significance of manganeseiferous garnet in the Dartmoor granites,¹ the senior author found it necessary to determine whether the average composition of the Dartmoor species was fairly represented by the single complete analysis (II, below) hitherto available—that of an aggregate of garnet fragments separated from crushed tor-granite.

As a preliminary step a similar aggregate from the cordierite-rich granite exposed in the Sweltor quarry was analysed (I). Comparison of the two analyses reveals an important variation in respect of MnO content:

	I.	II.
SiO ₂	36.45 %	37.23 %
TiO ₂	0.69	nil
Al ₂ O ₃	21.01	20.66
Fe ₂ O ₃	2.10	1.33
FeO	32.89	29.67
MnO	3.45	7.30
MgO	0.95	2.00
CaO	2.43	1.31
H ₂ O above 110° ...	n.d.	0.57
H ₂ O below 110° ...	n.d.	0.13
	99.97	100.20
Sp. gr.	4.003	4.000

Atomic percentages: I. Fe₈₀ Mn_{8.5} Mg₄ Ca_{7.5}. II. Fe₇₀ Mn₁₇ Mg₉ Ca₄.

I. Garnet from the cordierite-rich contaminated granite, Sweltor quarry, west Dartmoor. Loc. cit., fig. 6, p. 187. Analyst, T. Marrack.

II. Garnet from Chinkwell Tor, east Dartmoor. Loc. cit., anal. no. 68, and Pl. XIII, fig. 6. Analyst, Dr. H. F. Harwood.

¹ A. Brammall and H. F. Harwood, The Dartmoor granites: their genetic relationships. Quart. Journ. Geol. Soc. London, 1932, vol. 88, pp. 189-191.

The probability that these two analyses did not cover the whole range of the MnO variation made supplementary determinations desirable. The fact of variation among the fragments composing an aggregate is readily determinable by exploiting small specific gravity differences, using a diffusion column of Clerici solution calibrated by means of index minerals of known specific gravity. Where any aggregate mentioned in the following list distributed itself over a significant density range, this range is indicated, together with corresponding MnO percentages determined by Dr. A. W. Groves :

Supplementary data for garnet aggregates.

<i>From tor-granites and their detritus :</i>				Sp. gr.	MnO %.
Top Tor, east Dartmoor	...	...	...	4.2	22.00
Saddle Tor, east Dartmoor	...	...	...	4.1-4.2	10.30
Tor detritus: R. Dart, below Dartmeet	...	...	...	3.7-4.2	9.47
" " Dartmeet	...	...	...	4.1	8.99
" " West Webburn stream	...	...	...	4.1-4.2	8.15
" " East Webburn stream	...	...	...	4.1-4.2	8.08
" " Dartmeet	...	...	...	4.1	7.33
Cf. Analysis II	...	...	...	4.0	7.30
<i>From granites below tor-horizons :</i>					
Below Vixen Tor, west Dartmoor	...	...	...	n.d.	4.64
" Hamel Down, east Dartmoor	...	...	...	3.7-4.2	4.00
" North Hessary Tor (Princetown quarry)	...	...	...	3.7-4.2	3.80
<i>From cordierite-rich granites :</i>					
Wall-like mass, $\frac{1}{2}$ -mile south-west of Rippon Tor				3.7-4.2	3.70
Pithill, near Ivybridge	...	...	...	3.7-4.1	3.37
Cf. Analysis I	...	...	...	4.003	3.45
<i>From a hornfelsed shale-xenolith :</i>					
Cordierite-spinel-andalusite-hornfels	...	...	...	ca. 4.0	5.0 \pm 0.5

These results, which show a wide variation range (MnO 3.37-22.0%), establish the fact of pronounced variation in garnet from one and the same granite-type. That such variation may be appreciable even in garnet from one and the same hand-specimen is shown by the following determinations :

	Sp. gr.	MnO %.
Burrator quarry: single crystal, fragmented and freed from traces of chlorite, &c.	3.7-4.1	4.95
Burrator quarry: single crystal, as above	3.7-4.1	3.56

Variability in garnet occurring as an accessory mineral in granite is not restricted to the Dartmoor species. A further example is provided by garnet from the Eskdale granite in Cumberland. Garnet

aggregates separated from each of two granite facies, both visibly garnetiferous and represented in a single block, gave the following results :

<i>Eskdale granite</i> : garnet from		Sp. gr.	MnO %
(a) a 2-inch vein of fine-grained aplitic granite	...	>4.15	7.08
	...	<4.15	4.15
(b) the normal biotite-granite	... ..	>4.2	7.36
	... ..	<4.2	6.59

In conclusion, it may be stated that both the basic mica and the cordierite associated with the garnet in the Dartmoor granites are similarly polyvarietal, even in the same hand-specimen of granite.

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