A NOTE ON THE TEXTURE OF THE CRESTMORE CONTACT ROCKS

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The original purpose of the present note was to record the microscopic textural relations of the new mineral tilleyite, described in the preceding paper, with its associated minerals. The scanty attention which has been accorded to the textures of the Crestmore contact zone, in spite of its extensive literature, appeared to justify a somewhat more general treatment.

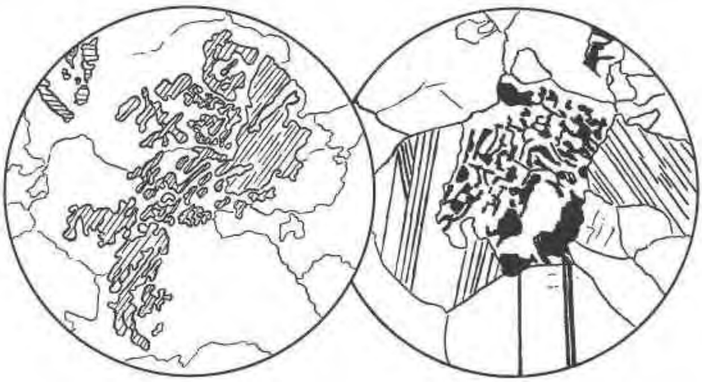
A. S. Eakle (1917) has attributed the metamorphism to the influences of three intrusives, a granodiorite, a quartz monzonite porphyry, and a series of pegmatite dikes. The earliest result of the invasion of the limestone may reasonably be supposed to have been the complete recrystallization of the rock. The grain of the resulting marble is coarse, and on Sky Blue Hill the grain size of the blue recrystallized calcite often exceeds 20 mm. In this rock there appear the minerals whose presence bears witness to the activity of solutions emanating from the cooling igneous rocks. As long as there remains any considerable amount of calcite, the new minerals appear as rounded or idiomorphic metacrysts. Grossularite, diopside, wollastonite, and vesuvianite are among the minerals which have developed good crystal outlines. The granular texture here is the one usually found in metamorphosed limestones.

GRAPHIC TEXTURES

In more intensely altered material, however, in which almost all the calcite has been replaced, the rock no longer has a simple granular texture, but shows a series of intergrowths which considered as geometrical patterns are identical with the micrographic texture familiarly seen in metals, metallic ores and igneous rocks. Such textures have not previously been described from lime-silicate rocks. In the Crestmore material, the following pairs of minerals have been observed in these relations:

Wollastonite—tilleyite
Wollastonite—gehlenite
Wollastonite—vesuvianite
Merwinite—grossularite

The origin of the graphic texture has been a much debated subject during the past decade, and it seems evident that no universally applicable mode of origin can be assigned to it. In the present case, an outstanding fact is that while one member is optically continuous over considerable areas, the other is generally not. Moreover, features such as twin-lamellae are sometimes clearly continuous in the dissected optically continuous individuals (see Fig. 1). This suggests that the optically continuous member was once physically continuous, and support for this view is found in the existence of all stages from complete individuals to highly intricate intergrowths, the stages corresponding to increasing completeness of replacement. The particular pattern shown is due to replacement having been controlled by the cleavage directions of the wollastonite and merwinite, these being the first-



A B

FIG. 1. Camera lucida drawings.

A, Merwinite (showing fine twinning), partly replaced by grossularite. The merwinite apparently remains from a single individual grain.

B, Tilleyite (black) replacing wollastonite along cleavage directions. Sketch also shows twinned merwinite grains.

formed minerals. Wollastonite with its three cleavages is especially well adapted to respond in this way to replacement. Confirmation of the suggested mode of origin of the micrographic textures is provided by the clear evidence that each of the second named minerals also attacks and replaces wollastonite and merwinite without producing intergrowths. Tilleyite appears to have been a later mineral than wollastonite, merwinite, spurrite and gehlenite, for it appears along the grain boundaries between these minerals. Grossularite is later than all these minerals and cuts across all impartially.

Inclusions

Less readily interpreted are the orientated inclusions of merwinite which occur in wollastonite. These are generally parallel to the {001} cleavage, though some also appear parallel to the {100} cleavage. The former cleavage is apparently poorly developed in spite of the great number of inclusions which follow its direction. The inclusions have a sharp rectangular form (Fig. 2A) and in view of their parallel orientation cannot be regarded as replacement residuals. The fact that their outline is clearly controlled not by the crystallography of the merwinite but by that of the wollastonite is an argument against an origin as metacrysts. The only remaining possibility is, therefore, that these represent simultaneous crystallization of merwinite and wollastonite; and to this possibility the general relationship of these minerals in the rock lends support. A. F. Rogers (1929) has described orientated inclusions of magnetite in periclase.

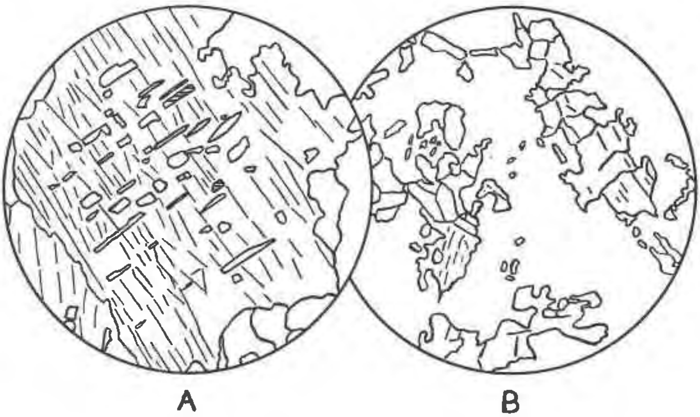


Fig. 2. Camera lucida drawings.

A, Inclusions of merwinite in wollastonite, orientated parallel to the {001} cleavage.

B, Irregular remnants of wollastonite in vesuvianite.

Sequence

While it is not possible, owing to the scattered nature of the minerals in the rock, to present a complete succession of minerals, the following sequence, based upon observed replacement relations, may be of interest:

1. Recrystallization of limestone
2. Wollastonite, merwinite, spurrite, monticellite
3. Gehlenite
4. Tilleyite
5. Garnet, vesuvianite
6. Thaumasite, in cross cutting veinlets

Several specimens also showed that diopside is replaced by garnet and vesuvianite. The sequence of minerals is held to reflect the sequence of changes in composition of the solutions. The relatively late accession of alumina-rich minerals is noteworthy.

References

Eakle, A. S., 1917. Minerals associated with the crystalline limestone at Crestmore, Riverside County, California: *Univ. California Geol. Bull.*, **x**, pp. 327–360.

Rogers, A. F., 1929. Periclase from Crestmore, with a list of minerals from this locality: *Amer. Mineral.*, **xiv**, pp. 462–469.