SHORTER COMMUNICATIONS

THE PETROLOGY OF DAWSONITE AT THE TYPE LOCALITY, MONTREAL

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Although the occurrence of dawsonite, $NaAl(CO_3)(OH)_2$, on the McGill University campus, Montreal, Que., has been known for nearly one hundred years, it appears that no petrographic studies were made by earlier workers and, because the outcrops had long been covered by construction, it had not been possible to interpret fully the petrology of the deposits. However, an opportunity to study dawsonite from unaltered material in freshly blasted rock some twenty-five feet below the outcrop surface was presented by excavations for a new Humanities Building on the campus in September and October, 1963. Field relations could be well observed and thin sections made from specimens taken at regular intervals across the feldspathic dike in which the dawsonite occurs.

Dawsonite was first collected as "a probably new mineral species" by Principal William Dawson of McGill University a century ago, and named in his honour by Harrington, who published the first description of the new mineral in 1875. It was found as bladed crystals and rosettes on a small outcrop on the McGill campus adjacent to the Arts Building, where it was described as covering the joint planes of a "trachytic dike" (Harrington, 1875). This feldspathic dike, approximately five feet wide, cuts through the Ordovician (Trenton) limestone almost vertically, and appears to be one of the many Cretaceous dikes associated with the Mount Royal gabbro-syenite stock.

Although Dawson was the first to recognize the unique character of the material, specimens were included in the mineral collection of Dr. A. F. Holmes, the early Montreal physician and mineral collector whose private cabinet was acquired by McGill in 1856. Dr. Holmes had collected from the same campus locality and had labeled the mineral "Tremolite". The dike itself was described in 1863 by T. Sterry Hunt in Logan's "Geology of Canada". He wrote: "The rock is divided by joints into irregular fragments, whose surfaces are often coated with thin bladed crystals of an aluminous mineral, apparently zeolitic." (Logan, 1863). It was this "apparently zeolitic" mineral that was named and described by Harrington as dawsonite. Further studies were made by Harrington (1883) and

Graham (1909). No further field work was possible after this period because the outcrops were obliterated by construction.

In 1954 dihydroxy aluminum sodium carbonate was synthesized by a pharmaceutical firm, and this preparation carefully compared at McGill with the Montreal dawsonite. Because the synthetic material was a very fine powder, its x-ray diffraction pattern was diffuse, but a similarity to the natural mineral* was suggested.

In the present study dawsonite was found to have two different modes of occurrence: in veinlets and in clusters. The dawsonite described in the earlier literature was that which occurs as narrow veinlets from a hair-line to 1 mm. wide. These were often conspicuous in outcrop as a coating along the joints of the feldspathic dike. The thin section study for this paper has revealed that the 1 mm.-wide veinlets possess a composite texture (Fig. 1) that consists of flat sheaves of dawsonite blades from

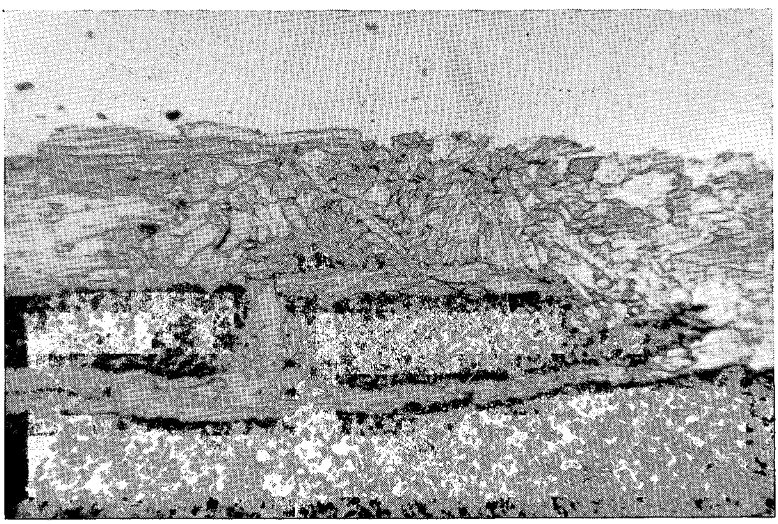

FIG. 1. Dawsonite veinlet lying along joint plane and penetrating feldspathic dike (darker grey). Plane light. ×40.

4 mm. to 16 mm. long, along the walls of the vein, and a central filling of smaller blades that are not parallel to the walls (in fact, many are normal to the walls), giving in many places a comb-like texture to the veinlets. A further feature of these veinlets revealed by petrographic study is that calcite occurs scattered as rhombohedral grains from 0.2 mm. to 1 mm.

*X-ray powder data file, card 12–449, American Society for Testing Materials, Philadelphia.

in size, throughout the meshwork of dawsonite blades in the central portions of the veins (Fig. 2). The amount varies considerably, but in many sections the calcite is as high as five per cent. The finding of this calcite within the dawsonite veinlets is important, because it shows for the first time why the earlier workers continued to note a CaO content in all analyses of this "carbonate of soda and alumina" despite the fact that

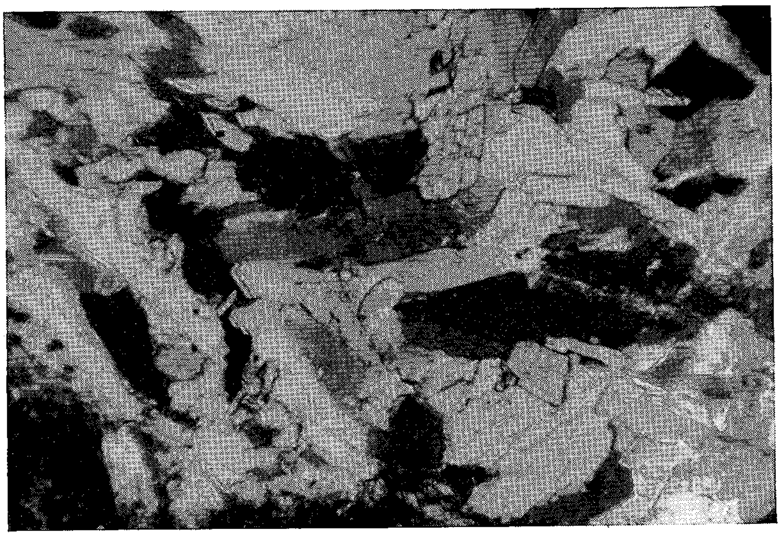

FIG. 2. A portion of dawsonite veinlet with calcite crystals (showing rhombohedral cleavage). Crossed nicols. ×160.

great efforts were made to obtain carefully selected samples free of limestone.

In addition to the dawsonite seen in the veinlets, abundant dawsonite occurs as well-defined clusters scattered throughout the dike, away from the veinlets and within the coarser-grained middle portion of the dike. These clusters range from 0.1 mm. to 1 mm. in diameter, and consist principally of blades of dawsonite from 0.05 mm. to 0.5 mm. long. When studied under the microscope, some clusters of dawsonite are seen to include calcite and abundant bundles of kaolinite crystals. Around the peripheries of the clusters are found crystals of dawsonite intergrown with coarse albite laths of the dike matrix. A further feature of the cluster dawsonite is its tendency to gather around cubes of pyrite, which are scattered throughout the dike.

The microscopic features described above point to an early hydrothermal origin for the dawsonite as a primary mineral. Because the coarse kaolinite found with the dawsonite obviously has not formed by alteration of feldspar, it is thought to be hydrothermal also. The common association of the dawsonite with pyrite, not only in the veinlets but also very definitely around the disseminated cubes of pyrite away from the veins, is further evidence of hydrothermal origin. Very small amounts of galena and arsenopyrite also occur with the veinlet dawsonite, also evidence of hydrothermal origin.

The emplacement of dawsonite seems to have been of two types: first, along obvious joints formed on cooling of the dike; second, by percolation away from the joints to collect as clusters. In the finer-grained parts of the dike these clusters are aligned and connected by a hair-line veinlet of dawsonite, but in the coarser parts they are unconnected and show no obvious feeding relation to the wider veinlets that fill joints. There are also the many clusters which collected around pyrite cubes.

Optical constants, determined for the newly collected material, are in agreement with those of Graham (1909) and Larsen & Berman (1934).

During the many years since the original collecting of dawsonite at McGill, several workers have reported dawsonite elsewhere in the vicinity of the Mount Royal stock or adjacent to the other similar alkalic intrusives in the district known as the Monteregian Hills. However, Redpath Museum does not have any verified specimens of local dawsonite except those from various parts of the dike in which the original find was made, and it seems possible that on occasion other minerals of similar appearance have been misidentified as dawsonite. It would appear that unique conditions obtained in and along the McGill feldspathic dike at the time of the formation of the dawsonite.

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