

*Some additional localities for Idocrase in Cornwall.*¹

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THE continuation of the mapping of the aureole of metamorphism round the Bodmin Moor granite has led to the discovery of fresh occurrences of idocrase, developed in the altered, impure limestones. The failure to find this mineral hitherto is now clearly due to the former absence of artificial openings in suitable localities, for the mineral has so far not been found in recognizable form in natural exposures, owing to the rapidity with which these calcareous rocks decompose.

Altered calcareous rocks containing idocrase in considerable abundance have recently been laid open in a small quarry on the west side of the stream at Trenuth Mill, which is about 400 yards south of the granite margin in the well-known Caradon area. The groundmass of the rock here is of a pale green or greenish-grey tint, of almost flinty hardness, and very fine texture; in it are set a number of small lenticular patches, the texture of which is much coarser. These have a well-marked reddish tint and are composed chiefly of garnet and idocrase, the latter being identifiable with a hand-lens by its pale brown colour; the association is thus typical and has been recorded from many areas. The small quarry was opened for road-metal, but the rock has proved so difficult to drill and break up, that the opening is to be filled in, and this locality for idocrase will be practically lost.

The second outcrop of idocrase-bearing rock also occurs in the Caradon area, east of South Yolland Farm and at the same distance (400 yards) from the granite margin; but in this instance there is no true exposure of the rock. Blocks of it, identical with those already described, occur scattered, and in small heaps, along the hedge sides, where they have been deposited after being blasted out of the fields, owing to their proving an obstruction to ploughing. Many interesting specimens of

¹ Communicated by permission of the Director of H.M. Geological Survey. Compare G. Barrow and H. H. Thomas, 'On the occurrence of metamorphic minerals in calcareous rocks in the Bodmin and Camelford areas, Cornwall.' *Min. Mag.*, 1908, vol. xv, pp. 113-123.

altered calcareous rocks, obtained in this manner, may now be found either in a similar position, or built into the field-walls that lie along the outcrop of the calcareous rocks, within the granite aureole of metamorphism. When the Geological Survey map of the district is published showing these outcrops there will be little difficulty in finding localities where excellent examples of the different phases of metamorphism of these calcareous rocks (calc-flintas) may be obtained.

Generally the idocrase does not form good crystals, for the individuals interfere with each other, but occasionally the coarser portions of the rock become somewhat drusy, and in the small cavities well-shaped crystals are fairly common. Where best formed the mineral builds crystals, ranging up to 6 mm. in length and 2 mm. in thickness, of dark to pale brown or amber colour with a somewhat resinous lustre. The crystals are most often attached to the matrix at each end, so that terminal faces can but rarely be observed. The prisms are usually square in section, being bounded by well-developed planes of the form $m\{110\}$; often, however, the form $a\{100\}$ is represented by narrow planes, and modification of the edge ma is sometimes noticeable. All the faces of the prism-zone, particularly the form $m\{110\}$, are finely striated parallel to the vertical axis. In some crystals there are indications of terminal faces represented by the basal plane $c\{001\}$ and the pyramid $p\{111\}$, the latter existing as somewhat narrow planes truncating the edges between the base and the prism.

Optically the sign of the zone of elongation is negative, and sections parallel to the basal plane show the emergence of a negative optic axis; no optical anomalies have been detected in those crystals investigated, the mineral being perfectly uniaxial. The prism-zone shows feeble pleochroism, but only where the crystals are fairly thick (0.25 mm. or more); light vibrating parallel to the optic axis is deep brown, and that vibrating at right angles a paler tint of the same colour.

In thin sections the idocrase exhibits certain peculiarities. In all cases it has a very low birefringence, but the value of the double refraction varies considerably, especially in the outer layers of the crystals, and in some instances becomes almost negligible. Sections cut parallel to the vertical axis, between crossed nicols, have the appearance of being polysynthetically twinned, a succession of light and dark bands being especially noticeable towards the outer portion of the crystals. Although these bands are most often arranged parallel to the vertical axis, similar layers may also be noticed crossing the prisms at right

angles. This feature is evidently due to the variation of the intensity of the double refraction in successive zones of growth, for all the layers extinguish simultaneously and have an exactly similar optical orientation. Basal sections show very slight indications of a prismatic cleavage, that parallel to the form $a\{100\}$ being the more distinct.

The mineral differs slightly from that described from Tyland quarry, Camelford,¹ in its deeper colour and its strictly uniaxial character. It is associated with a pale pink to pinkish-brown garnet, pale green pyroxene, and epidote.

The *garnet* is for the most part completely isotropic and much of it is without definite crystalline form. Where, however, crystals have formed they appear to be unmodified rhombic-dodecahedra. The outer layer only of these crystals is occasionally birefringent. Some of the best-shaped crystals are only skeletons, consisting of a thin skin of garnet enclosing granular calcite or some other mineral. Well-formed crystals without inclusions occur completely embedded in optically continuous idocrase, while some skeleton-garnets are surrounded by idocrase and have an infilling of the same mineral in optical continuity with that outside; this feature was also noted in the case of skeleton-garnets occurring in the epidote mentioned below.

The *pyroxene* is a diopside forming somewhat irregular small patches. It is elongated parallel to the intersection of the cleavages, but shows no traces of terminations. The zone of elongation is positive, and sections parallel to the plane of symmetry $b(010)$ give an extinction of about 25° . In thin sections it is colourless.

The *epidote*, which occurs in grains and crystalline aggregates, has an exceedingly low extinction and birefringence for this mineral, and thus most probably approximates to the clinzoisites. A more ferruginous variety with sensible pleochroism in shades of yellow also occurs sparingly. It encloses irregular patches and skeleton-crystals of garnet.

¹ G. Barrow and H. H. Thomas, *Min. Mag.*, 1908, vol. xv, p. 121.