Rhodonite from Meldon, Okehampton, Devonshire

By W. R. Dearman

Department of Geology, University of Newcastle upon Tyne

[Read 9 June 1966]

Summary. There are two outcrops of rhodonite rock at the same stratigraphical horizon in Lower Carboniferous rocks in the Railway Quarry at Meldon. One of these is zoned outwards from rhodonite, through calc-silicate hornfels to quartzite. Well-formed crystals occur in drusy massive rhodonite; examples have been measured and drawn.

An account has been given by Howie (1965) of the mineralogy of the manganese deposits in the Lower Culm Measures (Lower Carboniferous) in the Meldon Railway Quarry near Okehampton, but it is not clear from the description that there are (or were, since one has been quarried away) two quite distinct local deposits with essentially the same characteristics. The first of these was encountered in the 950 South Bay of the quarry (Dearman, 1959) in 1951 and had been quarried through by 1953; it is the restricted occurrence of rhodonite with rhodochrosite and bustamite in the basal bed of the Calcareous Group of the Lower Culm mentioned briefly by Dearman and Butcher (1959, p. 84); the basal bed here lies on the steep northern limb of a complex syncline. The same bed crops out again in the southern limb of the fold exposed in a high-level quarry (Dearman, 1962, fig. 3, 1010 Quarry) 500 yds due south of the first occurrence (fig. 1*b*); another manganese deposit was found in 1956 in this outcrop of the basal bed; it had a strike length of 50 yds and has since been completely removed at this level, leaving a permanent exposure of highly quartzose basal bed in the south-western wall of the quarry (ibid., p. 10).

The rhodonite occurrence in the 950 South Bay

Quarrying in the 950 South Bay followed the strike of the basal bed of the Calcareous Group for just over 110 yds, rock being removed in 30-ft thick slices from clean quarry faces fifty or so feet high. Variations in paragenesis of the basal bed within these slices are shown diagrammatically in plan view on fig. 1*c*. Where first encountered the rock was a very fine-grained light-grey quartzite with occasionally small amounts of coarsely crystalline black sphalerite. This rock type persisted for 200 ft

and then passed into a massive light-brown rock with varied assemblages of coarse-grained well-crystallized pale honey-brown to colourless axinite, pale green diopside, quartz with icositetrahedra of brownish-red

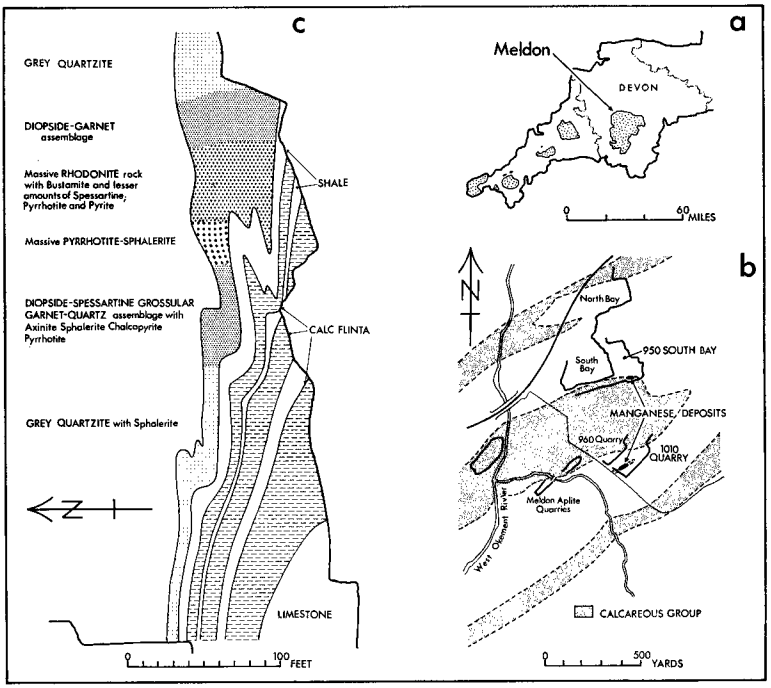

FIG. 1. The rhodonite deposits at Meldon. *a*. Locality map of SW. England; granite outcrops stippled. *b*. Outline map of the Meldon Railway Quarries showing the two rhodonite outcrops. *c*. Map of the basal bed of the Calcareous Group in the floor of the 950 South Bay of the Railway Quarry.

spessartine–grossular garnet (Howie, 1965, fig. 2), black sphalerite, chalcopyrite, and pyrrhotine. The light-grey quartzite persisted as irregular masses and smaller patches throughout this zone, which was 50 ft long. The next change saw the whole 12-ft thickness of the bed represented by massive, and in places coarsely crystalline, sphalerite–pyrrhotine rock. Within the sulphide rock, zoned ovoids a few inches long had a core of coarse-grained milky quartz, overlain by dark-brown fibrous bustamite with an outer layer of rhodonite. A final change to massive rhodonite rock was heralded by the onset of massive pyrrhotine–rhodonite–tephroite rock.

Pink massive rhodonite occupied a strike length of 50 ft in the bed;

light-grey quartzite was still present as irregular patches surrounded and veined by rhodonite in which grains of golden-yellow spessartine were embedded. Coarse radiating crystals of light-brown bustamite (Howie, 1965, fig. 1), pale flesh-pink when first exposed, accompanied massive rhodonite as complete spherical aggregates up to 3 in. in diameter; bladed slightly divergent masses up to 9 in. long were also found.

First the diopside assemblage and then the quartzite were repeated on the far side of the massive rhodonite zone before the bed swung away from the quarry area. It is difficult to assess the shape of the rhodonite deposit; the basal bed is folded (fig. 1*c*) with the folds plunging down to the west so that in the direction in which the quarry face was advanced successively lower levels in the bed were exposed. That the central rhodonite mass was not elongated in the direction of fold plunge is shown by the restriction of the rock type to a strike length of 50 ft confined within quarry faces 40 to 50 ft high. Unless the deposit is a ribbon-like development down the dip, it seems likely that the central mass of rhodonite had a circular or elliptical shape in the bedding plane. An inner core was surrounded by diopside–garnet rock grading out into grey quartzite.

Rhodonite crystals from the 950 South Bay

The massive rhodonite rock was drusy with the irregular cavities lined with crystals of rhodonite, rarely longer than 5 mm, on which had been deposited small globules and sheaves of pale pink rhodochrosite, pyrrhotine, and pyrite. Joints were plated with thin films of the sulphides, small rhodonite crystals, and radiating acicular crystals of bustamite.

The rhodonite crystals from the druses are a few millimetres long, sharp and well defined although some of the faces are rough and others deeply fluted. They are predominantly simple combinations of $m\{110\}$, $M\{1\bar{1}0\}$, and $k\{\bar{2}21\}$ with $\{1\bar{1}0\}$ prominently developed, closely similar to those from Treburland manganese mine, Altarnun, Cornwall, described by Sir Arthur Russell in 1946 as resembling in habit very acute rhombohedra. Faces $\{1\bar{1}0\}$ and $\{\bar{2}21\}$ may be striated or fluted parallel to their mutual intersection from repetition of these two forms (fig. 2*a*).

In the fissures the crystals tend to stand with $\{110\}$ outermost; on extraction they break up readily into cleavage rhombs bounded by $c\{001\}$, $m\{110\}$, and $M\{1\bar{1}0\}$. The examples measured are singly terminated, having broken off on the perfect (110) cleavage. The first (fig. 2*b*; B.M. 1966, 213) is tabular, elongated in the direction of intersection of $M(1\bar{1}0)$ with $k(\bar{2}21)$. The $\{1\bar{1}0\}$ faces are striated or finely fluted in the same

direction. The forms[1] present are $a\{100\}$, $b\{010\}$, $c\{001\}$, $m\{110\}$, $M\{1\bar{1}0\}$, $\{\bar{1}01\}$, $p\{111\}$, $k\{\bar{2}21\}$, $i\{\bar{4}41\}$, $\{\bar{4}\bar{4}5\}$, $r\{\bar{1}\bar{1}1\}$, $l\{\bar{4}\bar{4}3\}$, $n\{\bar{2}\bar{2}1\}$, and $\pi\{1\bar{1}1\}$. Small faces grouped around (110) are dull, striated or fluted, but sufficiently accurate measurements could be made to identify them.

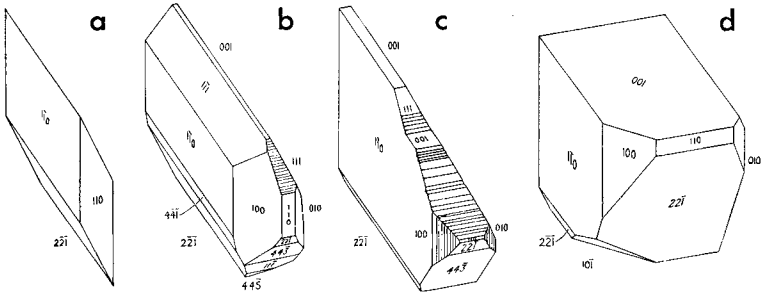

FIG. 2. Crystals of rhodonite from the 950 South Bay of the Meldon Railway Quarry.

A second crystal (fig. 2*c*; B.M. 1966, 214) has a wedge-shaped cross-section in the plane of the (010)-cleavage produced by unequal development of opposite faces of the forms $\{1\bar{1}0\}$ and $\{\bar{2}21\}$. The $\{\bar{2}21\}$ faces are striated parallel to smooth $\{1\bar{1}0\}$ faces, and between the two faces is a very narrow, brilliant, $\{\bar{4}41\}$ face not shown on the diagram. There is strong fluting on (100) and (010) faces parallel to their intersection with (110). The large pyramid face (111) is horizontally striated from repetition of adjoining (001) and (110) faces; a band of fluting on this face represents equal development of (001) and (110) and larger flats are formed by (001).

Fig. 2*d* (B.M. 1966, 212) represents half of an atypical stumpy combination that is twinned on (010); the forms present are $c\{001\}$, $M\{1\bar{1}0\}$, and $n\{\bar{2}\bar{2}1\}$, largely developed, with small $a\{100\}$, $b\{010\}$, $m\{110\}$, $\{\bar{1}01\}$, and also very narrow but brilliant faces $i\{\bar{4}41\}$ between $\{1\bar{1}0\}$ and $\{\bar{2}21\}$ not shown on the drawing. The $\{1\bar{1}0\}$ faces are striated parallel to their intersections with $\{\bar{2}\bar{2}1\}$.

Specimens have been presented to the British Museum (Nat. Hist.).

References

DEARMAN (W. R.), 1959. Quart. Journ. geol. Soc. Lond., vol. 115, p. 65.
—— 1962. Geol. Assoc. Guides, No. 33.
—— and BUTCHER (N. E.), 1959. Proc. Geol. Assoc., vol. 70, p. 51 [M.A. **16**–53].
HOWIE (R. A.), 1965. Min. Mag., vol. 34, p. 249.
RUSSELL (Sir A.), 1946. *Ibid.*, vol. 27, p. 221.

[1] Axes of reference as in Dana's System of Mineralogy, 6th edn, 1892.

[*Manuscript received 9 March 1966.*]