Hodge-Smith, T., 1934. Mineralogical notes. No. V. *Records of the Australian Museum* 19(3): 165–176. [28 September 1934].

doi:10.3853/j.0067-1975.19.1934.696

ISSN 0067-1975

Published by the Australian Museum, Sydney

# MINERALOGICAL NOTES, No. V.*

By

T. Hodge-Smith,

(Mineralogist and Petrologist, The Australian Museum.)

CONTENTS.



---

## Stolzite.

Broken Hill, New South Wales.

(Figures 1–4.)

A number of interesting specimens of stolzite from a new find at Broken Hill, New South Wales, were collected by Mr. M. Mawby and obtained by exchange for the collection of this Museum. All the material was secured from Section Cc, 525 feet level, South Mine, Broken Hill.

The discovery of stolzite in this mine is of particular interest in view of the statement of Mr. Geo. Smith [1] that stolzite was peculiar to the Proprietary Mine, and that it was found only in the upper portion of the oxidised zone. Mr. Smith's description applies only to the upper and oxidised portion of the Broken Hill lodes.

The paragenesis of the mineral in the South Mine appears to be distinct from that of the stolzite found in the Proprietary; according to Smith, the associated minerals in the latter case are manganic ironstone and quartz or garnet sandstone, though Hlawatsch [2] records one specimen in which the crystals are seated on decomposed galena. In the South Mine the associated minerals are secondary galena, stalactitic smithsonite, and cerussite.

The colour of the mineral varies from colourless to very pale grey. Colourless crystals in the Proprietary are rare, and are always tabular in habit.

The habit of the crystals in the Proprietary Mine has been summarised by Mr. G. W. Card [3] as follows :—

"(*a*) Flattened, leaden-grey, tetragonal pyramids, with little or no prism.

(*b*) Leaden-grey tetragonal prisms with low pyramids.

(*c*) Claret-coloured pyramidal forms, perhaps hemihedral.

(*d*) Colourless or white crystals with adamantine lustre; very tabular in habit . . ."

---

* For No. IV, see "Records of the Australian Museum," vol. xvii, No. 9, 1930, p. 408.

[1] Smith.—Geol. Surv. New South Wales, Min. Res. No. 34, 1926, pp. 88-89, 105.

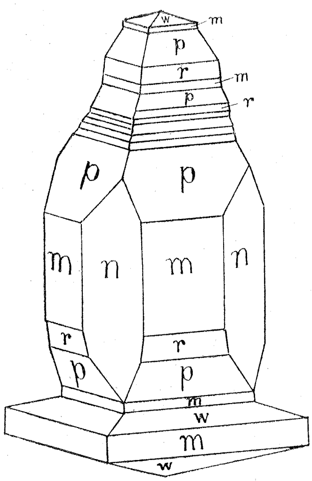
[2] Hlawatsch.—Ann. K. K. Naturh. Hofmus. Vienna, xii, p. 33.

[3] Card, G. W.—Rec. Geol. Surv. New South Wales, v, 1897, p. 121.

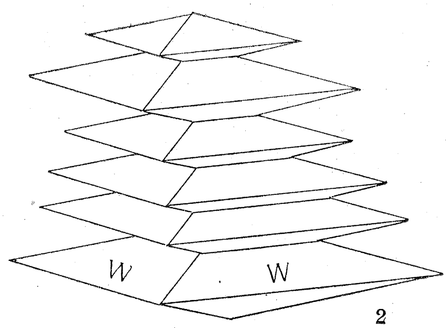
*36368—A

There appears to be no further description of the habit of the first type recorded, and in order to find out what pyramid is represented a crystal was selected for measurement, and the form established as the second order tetragonal bi-pyramid d (013) (Figure 4). Unfortunately, I was unable to obtain any crystals of the second type suitable for measurement, so that it is impossible to say which prism is present.

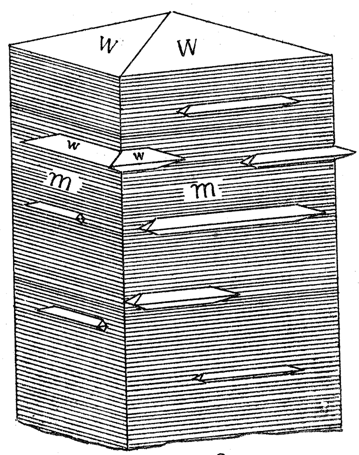
The third type has been described and figured by Hlawatsch,[4] and also by Glastonbury and Semmens.[5]

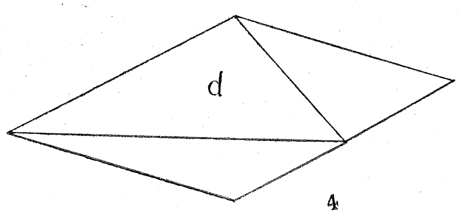



1




2




4

3

Figures 1–3.

Stolzite, South Mine, Broken Hill, New South Wales. Forms: m (110), n (130), p (111), w (117), and a new form, r (441).

Figure 4.

Stolzite, Proprietary Mine, Broken Hill, New South Wales. Form: d (013).

---

[4] Hlawatsch.—*Loc. cit.*

[5] Glastonbury and Semmens.—Proc. Roy. Soc. S. Austr., lii, 1929, pp. 259–260.

Mr. H. F. Whitworth, of the Geological Survey of New South Wales, very kindly supplied a crystal of the fourth type for purposes of measurement. This crystal proved to be tabular on the basal plane, with the edges bevelled by the second order tetragonal bi-pyramid e (011). The prism m (110) was the only other form present, and it was represented by an extremely narrow face only.

The crystals from the South Mine exhibit two distinct habits, (*a*) the flat pyramidal type and (*b*) the prismatic type. These appear at first sight to belong to Card's first two types from the Proprietary Mine, but the important difference is that the crystals of the South Mine possess first order forms, while those from the Proprietary are of the second order.

In the crystals from the South Mine there is a gradation, or, perhaps, more correctly, an oscillation between the two types. The pyramidal type often occurs as groups of individuals in parallel growth with their c-axes co-linear. Generally, the prism forms are completely absent in this type, but in some cases they are present as narrow faces. Occasionally a crystal of this type is seated on one of the prismatic type in such a manner as to be similarly oriented. In one or two crystals of the prismatic type pyramids project from the prism faces in position of parallel growth. Invariably the prism faces are striated horizontally, and give blurred or multiple signals, and often the crystals are tapering owing to an oscillation of the pyramids and prisms. The prismatic type is always terminated by the same flat pyramid of the first type. During the deposition of the crystals there appears to have been a fairly rapid oscillation of conditions of crystallisation capable of producing one or other type.

Among the specimens examined were a number of irregular crusts or plates of stolzite, which are formed by the junction of a number of crystals of the flat pyramidal type, so arranged that their c-axes are nearly but not quite parallel.

(*a*) Flat Pyramidal Type (Figure 2).—The crystals of this type consist of the first order tetragonal bi-pyramid w (117), which is a rare form, and has been previously recorded only from Ozieri, Sardinia, by Artini [6]. Occasionally there is a rounding of the edges w : w producing a rounded second order tetragonal bi-pyramid, which could not be determined. In some of the larger crystals the prism m (110) was present, and in one of the crystals the form n (130) was recognised. This appears to be a somewhat rare form, but was first recorded by Emerson [7] in 1895 from Laudville, Massachussetts, U.S.A.

The crystals were measured on a two-circle goniometer, but no really good results were obtained. When the prisms are present they give only blurred signals, while the pyramidal form gives no signal at all, owing to a very fine etching of the faces. In order to obtain measurements of the flat pyramid, two of the larger crystals were selected and small pieces of cover glass (as used for microscope slides) were temporarily cemented to the faces by moisture. The average measured $\rho$ angle is 17° 13′, and the limits of the readings are 17° 06′ and 17° 34′. The calculated $\rho$ angle is 17° 30′. The interfacial angle was measured on one of the prismatic crystals, where the form was found to lie in the zone 110 : 001. The crystals varied in size from 1 mm. to 8 mm. square.

[6] Artini.—Rend. Inst. Lomb. Milan, xxxviii, 1905, p. 373.
[7] Emerson.—U.S. Geol. Surv., Bull. 126, 1895, p. 163.

(*b*) Prismatic Type (Figures 1 and 3).—The prism m (110) always gives a series of blurred signals. The faces are horizontally striated, often alternate with the pyramids noted below, and are generally tapered, varying from the normal position by as much as 5°. A prism often having faces larger than those of the form m (110) is very characteristic of these crystals. It is not striated, but is always very dull, giving no signal and making it necessary to use the position of maximum illumination, so that accurate results could not be hoped for. The weighted average measured φ angle for twelve readings is 18° 40′, and the limits are 17° 41′ to 20° 10′. There can be little doubt that this corresponds to the rare form n (130). The only pyramids recognised are the first order tetragonal bi-pyramids, of which p (111) always gave good to fair signals. In every case this form was used for the purpose of centering the crystals. Another pyramid, present on all the crystals measured gave an average measured ρ angle of 83° 49′, with limits of 83° 31′ to 83° 52′. This corresponds to an unrecorded form r (441) with a calculated ρ angle of 83° 32′. The crystals were invariably terminated by the form w (117), which is finely etched, and gives no signal as in the case of the flat pyramidal type.

Some of the crystals were doubly terminated. They varied in size from 0·5 mm. x 1 mm. to 7 mm. x 12 mm., measured along the *a* and *c* axes respectively.

The following table gives the measured and calculated φ and ρ angles :—

| Form. | Measured. | | Calculated. | | Error. | |
|---|---|---|---|---|---|---|
| | φ | ρ | φ | ρ | φ | ρ |
| | ° ′ | ° ′ | ° ′ | ° ′ | ′ | ′ |
| m (110) ... | 44 56 | 88 02 | 45 00 | 90 00 | 4 | 118 |
| n (130) ... | 18 40 | ... | 18 26 | 90 00 | 14 | ... |
| p (111) ... | 44 56 | 65 36 | 45 00 | 65 43 | 4 | 7 |
| r (441)* ... | 44 50 | 83 49 | 45 00 | 83 32 | 10 | 17 |
| w (117) ... | 44 27 | 17 13 | 45 00 | 17 30 | 33 | 17 |

* New form.

## Vanadinite.

Broken Hill, New South Wales.

(Figure 5.)

The collection of fossils and minerals of the late John Mitchell, purchased by the Trustees of this Museum, contained a few specimens of Broken Hill minerals consisting of the rarer species collected in the early days of Broken Hill. Among these is a small specimen of rather pale ruby-red crystals, seated on a mass of calcite with limonite. Unfortunately, the name of the mine from which the specimen came is not recorded. According to Mr. Geo. Smith [8] the vanadinite was most frequently found in the Proprietary Mine, but was also seen in other mines. In the Consols Mine the vanadinite was confined to the vughy portions of the lode, of which pseudomorphs of limonite after calcite formed a part. So that it is probable that this is the mine from which the specimen was obtained.

[8] Smith.—*Loc. cit.*, pp. 50 and 89.

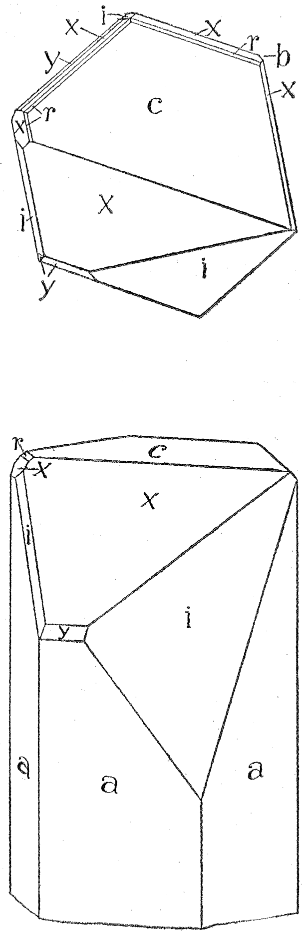



Figure 5.

Orthographic and clinographic projections of vanadinite, Broken Hill, New South Wales. Forms: c (0001), a (10$\bar{1}$0), b (11$\bar{2}$0), r (10$\bar{1}$2), x (10$\bar{1}$1), y (20$\bar{2}$1), i (21$\bar{3}$1).

Unfortunately, many of the crystals were broken, but one complete crystal was secured and measured on a two-circle goniometer with the following results :—

| Form. | Measured. | | Calculated. | | Error. | |
|---|---|---|---|---|---|---|
| | φ | ρ | φ | ρ | φ | ρ |
| | ° ′ | ° ′ | ° ′ | ° ′ | ′ | ′ |
| c (0001) ... | ... | 0 00 | ... | 00 00 | 0 | 0 |
| a (10$\bar{1}$0) ... | 0 02 | 89 57 | 30 00 | 90 00 | 2 | 2 |
| b (11$\bar{2}$0) ... | 30 00 | 89 55 | 30 00 | 90 00 | 0 | 5 |
| r (10$\bar{1}$2) ... | 0 00 | 22 18 | 0 00 | 22 21 | 0 | 3 |
| x (10$\bar{1}$1) ... | 0 04 | 39 30 | 0 00 | 39 26 | 4 | 4 |
| y (20$\bar{2}$1) ... | 0 02 | 58 43 | 0 00 | 58 42 | 2 | 1 |
| i (21$\bar{3}$1) ... | 19 07 | 65 18 | 19 06 | 65 19 | 1 | 1 |

Generally, the faces are all bright, giving fair to excellent signals. The arrangements of the terminal faces is peculiar owing to the unequal development of the faces on one half of the termination. The existence of a large face of the form **x** (10$\bar{1}$1) gives to the crystal a monoclinic appearance.

## Iridosmine.

Barraba, New South Wales.

Mr. F. Cook brought in a sample of a tin-white metallic mineral, which he had collected along with gold in the "dish" while working an alluvial gold deposit at a locality 4 miles south-east of Barraba, New South Wales. In all, the material weighed a little less than 2 grams. Qualitative chemical tests proved the mineral to be iridosmine. It occurred as small flat grains with a very distinct cleavage. The specific gravity as determined by Mr. R. O. Chalmers is 18·02.

The locality lies within the Great Serpentine Belt of New South Wales, as described by Professor W. N. Benson [9], and is a new occurrence of iridosmine in New South Wales. Although no deposits of commercial importance are known in New South Wales, the mineral has been recorded from several localities [10]. It is of interest to note that the presence of iridosmine in much of the gold won in New South Wales has been long known, which fact was first recorded by A. Leibius [11].

[9] Benson.—Proc. Linn. Soc. New South Wales, xlii, 1917, pp. 223–283.
[10] Anderson.—Geol. Surv. New South Wales, Min. Res. No. 22, 1916, p. 68.
[11] Leibius.—Trans. Phil. Soc. New South Wales, 1862–1865, p. 210.

## Cassiterite.

Storey's Creek, Tasmania.

(Figures 6–8.)

Recently over one hundred crystals and crystal fragments of cassiterite from Storey's Creek, Tasmania, were added to the collection of the Australian Museum. Storey's Creek is situated in the tin-mining district of Ben Lomond.

In 1901, G. A. Waller [12] reported on this field, describing the various leases, including that of the Storey's Creek Tin-mining Company. So far as I am able to discover, cassiterite crystals from Tasmania have not been figured before, though a description of crystals from Ben Lomond and Mount Bischoff has been given by W. Kohlmann [13], who states that crystals from Ben Lomond are of the pyramidal type, with the prism forms only poorly represented.

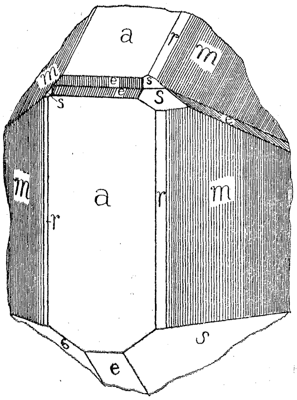
In all the crystals received from Storey's Creek the faces of the prism zone are the dominant ones. The crystals are almost invariably twinned, but are never complete. The matrix attached to some of the larger crystals appears to be somewhat decomposed felspar. The largest crystal measures 45 mm. x 35 mm. x 30 mm., but only two others are comparable with this one, the remainder varying from 15 mm. to 5 mm. measured in the longest direction. The colour is black, with an occasional tinting of ruby or resin.

Many of the crystals were either too large or too fragmentary for measurement on a two-circle goniometer, but ten were selected for measurement, and twelve forms have been recognised. The forms present on the individual crystals are shown in the following table :—

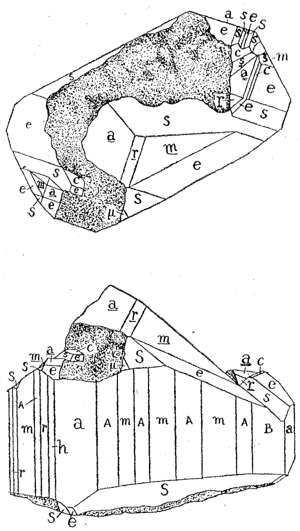
| Form. | Crystals. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | i | ii | iii | iv | v | vi | vii | viii | ix | x |
| c (001) ... | | | | | × | × | × | | | |
| a (010) ... | × | × | × | × | × | × | × | × | × | |
| m (110) ... | × | × | × | × | × | × | × | × | × | × |
| A (780) ... | | | | | | | × | | | |
| B (570) ... | | | | | | | × | | | |
| r (230) ... | × | × | × | × | × | × | × | × | × | |
| h (120) ... | | | | | × | × | × | × | × | |
| e (011) ... | × | × | × | × | × | × | × | × | × | |
| δ (223) ... | | | | | | | | | | × |
| s (111) ... | | × | × | × | × | × | × | × | × | × |
| ϱ (221) ... | | | | | | | | | | × |
| μ (676) ... | | × | | | | | × | | | |

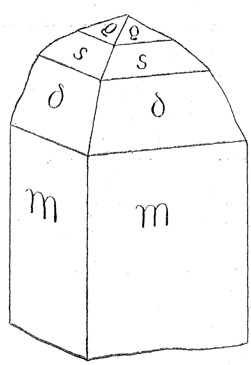
The forms m (110) and s (111) generally gave good signals, while a (100)' h (120), and e (101) gave very fair signals, and B (570) and μ (676) only fair signals; the remaining forms c (001), r (320), A (780), δ (223), and ϱ (221) yielded either blurred or bad signals.

[12] Waller, G. A.—Report on Tin-mining District of Ben Lomond, Dept. of Mines, Tas., 1901.
[13] Kohlmann, W.—Zeits. Kryst., xxiv, 1895, pp. 351–365.




6






7 8

Figure 6.

Knee-shaped twin of cassiterite, Storey's Creek, Tasmania. Forms: a (010), m (110), r (230), e (011), and s (111).

Figure 7.

Orthographic and clinographic projections of an interpenetration twin of cassiterite, from Storey's Creek, Tasmania. Forms: c (001), a (010), m (110), A (780), B (570), r (230), h (120), e (011), S (111), and $\mu$ (676).

Figure 8.

Cassiterite, Storey's Creek, Tasmania. Forms: m (110), $\delta$ (223), s (111), and $\varrho$ (221).

The following table gives the average observed and calculated φ and ρ angles :—

| Form. | | Measured. | | Calculated. | | Error. | |
|---|---|---|---|---|---|---|---|
| | | φ | ρ | φ | ρ | φ | ρ |
| | | ° ′ | ° ′ | ° ′ | ° ′ | ′ | ′ |
| c (001) | ... | ... | 0 00 | ... | 0 00 | ... | 0 |
| a (010) | ... | 0 06 | 90 01 | 0 00 | 90 00 | 06 | 01 |
| m (110) | ... | 44 58 | 90 00 | 45 00 | 90 00 | 02 | 00 |
| A (780) | ... | 41 12 | 90 00 | 41 11 | 90 00 | 01 | 00 |
| B (570) | ... | 35 05 | 90 00 | 35 32 | 90 00 | 27 | 00 |
| r (230) | ... | 33 47 | 89 54 | 33 41 | 90 00 | 06 | 06 |
| h (120) | ... | 26 36 | 90 00 | 26 34 | 90 00 | 02 | 00 |
| e (011) | ... | 0 05 | 33 55 | 0 00 | 33 54 | 05 | 01 |
| δ (223) | ... | 45 00 | 62 47 | 45 00 | 62 15 | 00 | 32 |
| s (111) | ... | 44 56 | 43 31 | 45 00 | 43 33 | 04 | 02 |
| ϱ (221) | ... | 45 00 | 32 22 | 45 00 | 32 22 | 00 | 00 |
| μ (676) | ... | 40 08 | 46 08 | 40 36 | 45 56 | 28 | 12 |
| $\underline{c}$ (001) | ... | 0 32 | 67 21 | 0 00 | 67 48 | 32 | 27 |
| $\underline{a}$ (010) | ... | 0 07 | 22 09 | 0 00 | 22 12 | 07 | 03 |
| $\underline{m}$ (110) | ... | 20 39 | 49 05 | 20 41 | 49 06 | 02 | 01 |
| $\underline{A}$ (780) | ... | 24 34 | 45 43 | 23 30 | 45 32 | 64 | 11 |
| $\underline{r}$ (230) | ... | 29 28 | 39 45 | 29 32 | 39 36 | 04 | 09 |
| $\underline{h}$ (120) | ... | 37 08 | 34 04 | 37 05 | 34 06 | 03 | 02 |
| | | 10 50 | 65 19 | 10 41 | 65 32 | 11 | 13 |
| $\underline{e}$ (011) | ... | 0 56 | 34 26 | 0 00 | 33 54 | 56 | 32 |
| | | 45 03 | 43 38 | 45 00 | 43 33 | 03 | 05 |
| $\underline{s}$ (111) | ... | 29 21 | 79 48 | 29 40 | 79 48 | 19 | 00 |

The crystals examined exhibit three distinct habits :—

(i) Knee-shaped twins, including crystals 1–6.
(ii) Interpenetration twins, including crystals 7–9.
(iii) Simple crystal, represented by crystal 10 only.

(i) The knee-shaped twins (Figure 6) are by far the most common type. They are always more or less fragmentary owing to the mode of attachment, and for this reason they were mounted on the goniometer with an a (010) face polar. They are generally doublets, and only rarely are triplets found. The three large crystals mentioned previously belong to this type. These crystals are very similar in habit to those described by Dr. Marie Bentivoglio [14] from the Stannum District, New South Wales.

[14] Bentivoglio, M.—Journ. Roy. Soc. New South Wales, xl, 1921, p. 78, fig. 3.

The forms e (011) and s (111) frequently oscillate one with the other, and when such oscillation is not present the form e (011) is invariably striated. The prism forms, with the exception of a (010), are all more or less vertically striated.

(ii) The interpenetration twins (Figure 7) are comparatively rare. They are characterised by the presence of a complete prism zone and by being doubly terminated, though neither termination is ever complete. In two of the crystals measured it was found that one termination showed no evidence of twinning whatever, but the other termination consists of several individuals, some in the twinned position and some in position of parallel growth.

The crystal figured is terminated at one end by at least two individuals in parallel position, two twinned individuals in parallel position, and one twinned on a different axis from the other two, while the other termination, though not complete, is a single individual. The arrangement of the faces of the prism is also peculiar insofar as the forms A (780), B (570), r (230), and h (120) appear on only one-half of the zone, while the other half consists of the forms a (010) and m (110) only.

(iii) The simple crystal (Figure 8) is represented by one crystal only. It is a fragment, and was attached to another crystal, but not in the twin position. It is a square prism, terminated by the first order bi-pyramids $\delta$ (223), s (111), and $\varrho$ (221). The only prism form present is m (110).

## Purpurite.

### Euriowie Range, New South Wales.

Mr. M. Mawby forwarded a number of pieces of a mineral which he suggested was purpurite. The material was obtained from near the Crown Mine, Euriowie Range, New South Wales. According to Mr. Mawby the mineral occurs only as a thin vertical seam less than an inch wide in a lithia-bearing albite pegmatite, and is evidently an alteration product of lithiophyllite.

Intimately associated with the mineral, and apparently a decomposition product of it, is a black phosphate with a greyish streak. This material is also found as an extremely thin coating on quartz.

As Mr. Mawby's tentative determination of the mineral as purpurite has been confirmed, and there does not appear to be any record of purpurite as occurring in New South Wales, a short description, together with a partial analysis, by Mr. R. O. Chalmers is given here.

The mineral is very dark reddish-purple in colour, almost black on the cleaved surfaces. In the hand specimen two cleavages approximately at right angles can be detected. They are not perfect. The lustre resembles that of bronzite, though sometimes somewhat dull. The hardness is 4.

Under the microscope a very well-marked parting at 68° to the principal cleavage is seen. It is made more prominent by the presence of a colourless mineral with a high refractive index, low double refraction, and straight extinction, possibly apatite. In places this mineral is replaced by a golden-yellow mineral. Of the two cleavages seen in the hand specimen one is more distinct than the other; both are more or less curved and much interrupted. Inclusions along the cleavage surfaces, probably due to alteration, of the same brownish yellow mineral, previously noted, are very common. No trace of the colourless mineral observed along the parting planes was noted along the cleavages. That the mineral has been subjected to strain is demonstrated by the presence of minute faults beautifully shown by the colourless mineral along the parting planes; possibly the curved cleavage surfaces are further evidence of this.

Pleochroism is well-marked, and the change of colour from rose-red to purple at right angles to the cleavage when absorption is greatest makes a very beautiful slide. Parallel extinction was observed. Unfortunately, no optical figure could be obtained.

Very small angular fragments of quartz appear to be the only other inclusions present beside those already described associated with the cleavage and parting.

Although every care was taken to obtain pure material for chemical analysis, it is obvious from an examination of slides that it is impossible to ensure this result. However, the results of a partial analysis made by Mr. R. O. Chalmers are sufficient definitely to identify the mineral as purpurite, first described by Graton and Schaller[15]. Owing to the small amount of material available, water was determined by difference; its presence has been proved qualitatively. The presence of lithium was determined by spectroscopic methods.

Partial analysis of purpurite from Euriowie Range, New South Wales, by R. O. Chalmers.

| | |
|---|---|
| $Fe_2O_3$ | 36·30 |
| $Mn_2O_3$ | 15·30 |
| $P_2O_5$ | 36·60 |
| CaO | 2·16 |
| $K_2O$ | 2·26 |
| $Na_2O$ | 1·60 |
| $SiO_2$ | 0·20 |
| $H_2O$ (by difference) | 5·30 |
| Insoluble residue | 0·28 |
| | 100·00 |

The excess of alkalies is probably due to the fact that the material was secured near the surface in a locality where weathering might be expected to produce such a result.

The molecular ratios of the principal constituents are as follows:—

| | | |
|---|---|---|
| $Fe_2O_3$ | 227 } | 1·11 |
| $Mn_2O_3$ | 097 } | |
| $P_2O_5$ | 258 | 0·88 |
| $H_2O$ | 294 | 1·00 |

Considering the nature of the material analysed, this is a close approximation to the formula of purpurite 2 (Fe, Mn) $PO_4$ + $H_2O$.

[15] Graton, L. C., and Schaller, W. T.—Am. Journ. Sci., xx, 1905, pp. 146–151.

## Bismutite.

### Kingsgate, New South Wales.

The collection of the late W. H. Yates was recently presented to the Trustees by the members of his family.

In the collection are four specimens of bismutite which are of particular interest in that the bismutite is pseudomorphous after molybdenite. The original molybdenite has almost entirely disappeared, but its form has been more or less perfectly preserved. It consisted of hexagonal plates in quartz, so typical of the molybdenite found in the pipes of Kingsgate. The bismutite is a pale greenish-yellow colour and is associated with bismite and molybdite.