

SHORT COMMUNICATIONS

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An antimonian idocrase from the Bau mining district, Sarawak, Malaysia

A ROCK specimen, K.132, containing radiating aggregates of pale-green prismatic crystals, was submitted for confirmation of the green mineral as idocrase by E. B. Wolfenden, Geological Survey, Borneo Region, Malaysia. The specimen was collected from an ore-body that forms a lens in marble adjacent to a hydrothermally altered porphyry dyke. The ore is described as rich in stibnite, containing abundant wollastonite and locally much epidote, in addition to quartz and calcite.

An X-ray diffraction photograph confirmed the green mineral as idocrase but its unusual optical properties warranted a more detailed examination.

Description. In hand-specimen the rock presents a typical skarn-like appearance, patchy and roughly banded. Idocrase-rich areas are conspicuous by their greenish-yellow colour in contrast to adjacent

cream-coloured quartz-wollastonite-calcite areas and stibnite veins. In thin-section (fig. 1) idocrase forms aggregates of fibrous to prismatic crystals in a wide range of grain sizes up to 1 mm in length. The larger crystals occur in euhedral radiating rosettes set in a matrix of coarse-grained calcite and subordinate quartz. Zoning is apparent in that there is an increase in both birefringence and intensity of pleochroism outward from the rosette centres along some of the prismatic grains. The calcite frequently contains aggregates of minute acicular wollastonite crystals, which sometimes occur alone as felted aggregates. Accessory stibnite may be intimately interleaved with the idocrase, particularly in the finer-grained aggregates. Trace

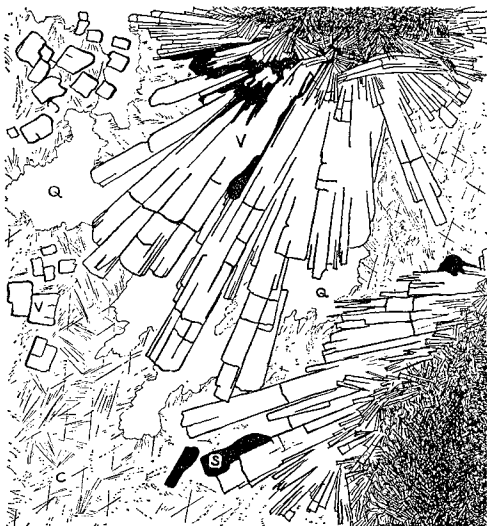


FIG. 1. Quartz-calcite-idocrase skarn from Sarawak. V, idocrase; Q, quartz; S, stibnite; C, calcite. $\times 16$.

amounts of grossular were identified only in rock crushed for mineral separation.

The idocrase is distinctive in having remarkably high refractive indices and birefringence (table I), far above the usual values for idocrase of ω 1.752, ϵ 1.746 (Deer *et al.*, 1962). The birefringence, 0.017 for the inner zones, reaches values in excess of 0.025 for the outer, high refractive index zones of some crystals.

TABLE I. Chemical analyses (A, B), atomic ratios to 76 oxygen (A'), and refractive indices of antimonian idocrase from the Bau mining district, Sarawak

	A	B	A'		ω	ϵ
SiO ₂	33.0	31.6	Si	18.26	Pale yellow-green	Colourless
TiO ₂	0.34	n.d.	Ti	0.14		
Al ₂ O ₃	11.2	9.4	Al	7.32	Majority of grains Minimum observed Outer zone of a few grains > 1.83	1.775 1.758 > 1.82
Fe ₂ O ₃	3.31	6.5*	Fe ³⁺	1.38		
FeO	4.06	n.d.	Fe ²⁺	1.88		
MnO	0.50	n.d.	Mn	0.23		
MgO	2.09	n.d.	Mg	1.72		
Li ₂ O	0.28	n.d.	Li	0.62		
Sb ₂ O ₃	15.73	15.20	Sb ³⁺	3.59		
CaO	23.80	n.d.	Ca	14.13		
Na ₂ O	0.52	n.d.	Na	0.56		
K ₂ O	0.52	n.d.	K	0.37		
H ₂ O ⁺	1.09	n.d.	OH	4.03		
H ₂ O ⁻	0.15	n.d.	O	71.97		
Quartz	1.0†	2.8†				
Sb	1.7†	1.19				
S		0.47				
Sum	99.41‡	—				

* Total iron as Fe₂O₃.

† From modal analysis (stibnite and quartz).

‡ Includes CuO 0.01, Cr₂O₃ 0.01, P₂O₅ 0.09, B₂O₃ 0.01 %.

Idocrase concentrates were separated for chemical analyses (A and B, table I) using heavy liquids and an isodynamic magnetic separator. A modal analysis of A (wt. %) showed stibnite = 1.7 and quartz = 1.0; B has stibnite = 1.7 and quartz = 2.8. The X-ray powder photographs of A showed traces of wollastonite and calcite. Slightly diffuse powder patterns resulted from the zoned nature of the particles but sharper patterns were obtained from tiny crushed single grains and gave the cell size as a 15.695 ± 0.020, c 11.890 ± 0.040 Å, using the indexing of Domańska *et al.* (1969).

An electron-probe microanalysis was carried out in the Petrographical Department, Institute of Geological Sciences, which showed that the ratio of antimony to calcium was higher in the outer zones (an average of 0.82:1) than in the centres of the crystals (average 0.68:1). The ratio in the analysed material is 0.75:1.

A cerian idocrase has been described (Murdoch and Ingram, 1966) with ω = 1.762 and ϵ = 1.750, which shows certain similarities with the present mineral, particularly in respect of the low calcium values. This suggests that the antimony is mainly substituted for calcium in the crystal structure.

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Beryl and cleavelandite from Bihar, India

ABOUT $\frac{1}{2}$ km NNW. of Rola village and 6 km E. of Hazaribagh, Bihar, a discordant body of beryl-bearing pegmatite occurs in a highly garnetiferous hornblende schist, which is in its turn a large xenolith in a fine-grained granite ($23^{\circ} 59' 45''$ N., $85^{\circ} 25' 22''$ E.). The pegmatite, of perthite–cleavelandite–quartz type, is fine-grained on the margins and coarser inwards, and contains numerous pear-shaped masses of cleavelandite, grown radially around tapered crystals of beryl; the tapered habit of the beryl is probably due to interference by the growing cleavelandite (cf. Shaub, 1937). These cleavelandite–beryl bodies are almost always rimmed by about 5 mm of a pinkish-brown microcline–perthite, which in places penetrates between the radiating cleavelandite crystals. Columbite occurs occasionally adjacent to the beryl crystals; rarely the cleavelandite is associated with biotite, and in one or two places bismutite is present.

The beryl is fairly rich in alkalis; an analysis by the Analytical Division, Bhabha Atomic Research Centre, Bombay, gave: SiO₂ 63.54, Al₂O₃ 18.60, total iron as Fe₂O₃ 0.75, BeO 13.25, MgO 1.26, CaO trace, Na₂O 0.65, K₂O trace, Rb₂O 0.02, Cs₂O 0.19, Li₂O trace, loss on ignition 1.52, total 99.78 %.

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