

sured specific gravity, symmetry requirements of the space group, and measured cell volume. This formula also happens to be charge balanced although this was not a strict requirement of the computer program. The postulated idealized formula is $2[\text{CuFe}(\text{SO}_4)_2(\text{OH}) \cdot 4\text{H}_2\text{O}]$. Ultimate proof of the formula is, of course, the structural determination now in progress.

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REFERENCES

- LAUSEN, C. (1928) Hydrous sulphates formed under fumerolic conditions at the United Verde mine. *Amer. Mineral.* **13**, 203-229.
- SMITH, J. V. (1965) X-ray-emission microanalysis of rock-forming minerals. I. Experimental techniques. *J. Geol.* **73**, 830-864.

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CONFIRMATION OF THE MINERAL SPECIES WHERRYITE

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ABSTRACT

The unit cell of wherryite is $a=20.82$, $b=5.79$, $c=9.17$ Å, $\beta=91^\circ 17'$; space group $C2$, Cm , or $C2/m$. Wherryite may be related to leadhillite.

INTRODUCTION

Wherryite was described in 1950 by Fahey, Daggett, and Gordon on material from the Mammoth mine, Tiger, Arizona. It was described as light green and as having a fine granular texture. The specific gravity was determined to be 6.45 and the chemical formula was given as $\text{Pb}_4\text{Cu}(\text{CO}_3)(\text{SO}_4)_2(\text{OH}, \text{Cl})_2\text{O}$. The validity of wherryite as a mineral species has been doubted (Strunz, 1966). The present work appears to confirm wherryite as a species distinct from caledonite and leadhillite.

SPECIMENS

The present study made use of three specimens from the Mammoth mine which will be referred to in this paper as specimens nos. 1, 2, and 3. Wherryite occurs on spec. no. 1 (USNM spec. no. 8171) as crystals which vary in color from pale yellow to bright yellowish-

green, and which vary in habit from fibrous through acicular to aggregates of relatively equidimensional crystals with largest dimensions of about 0.4mm. Spec. no. 2 (from the private collection of R. A. Bideaux) contains wherryite of a very pale green color and of habits which are similar to those of spec. no. 1. Spec. no. 3 (no. 8810 of the University of Arizona mineral museum collection) contains light green wherryite which has a fine granular texture.

X-RAY STUDY

Five powder films were taken in a 57.3mm diameter camera with $\text{CuK}\alpha$ radiation. The wherryite used came from the three specimens with all the above mentioned colors and habits represented by at least one film. There were no significant differences in these patterns.

TABLE 1. PARTIALLY INDEXED POWDER DATA FOR WHERRYITE

Fahey <i>et al.</i> , 1950		Present Study			
I	$d(\text{obs})$	I^a	$d(\text{obs})$	$d(\text{calc})$	hkl
		13	10.40	10.41	200
		10	6.98	6.96	20 $\bar{1}$
		4	5.57	5.58	110
30	4.77	35	4.78	4.78	11 $\bar{1}$
80	4.57	40	4.57	4.58	002
				4.57	40 $\bar{1}$
10	4.19	7	4.15	4.16	202
10	4.02	1	4.02	4.02	31 $\bar{1}$
		6	3.55	3.55	11 $\bar{2}$
20B	3.52	11	3.47	3.48	40 $\bar{2}$
				3.47	600
		22	3.22	3.22	31 $\bar{2}$
				3.21	601
80	3.14	100	3.16	3.17	312
				3.15	511
100	3.05	45	3.06	3.06	003
40	2.88	25	2.90	2.91	203
				2.89	020
60	2.74	50	2.75	2.76	021
				2.74	51 $\bar{2}$
				2.74	602
20	2.51	10B	2.52		
20	2.45	13	2.45		
30	2.29	9	2.29		
20	2.22	14	2.23		
20	2.05	2	2.06		
		10	2.04		
70	1.877	40	1.882		

^a Visual estimation.

Single crystals separated from the polycrystalline aggregate material of both spec. no. 1 and spec. no. 2 were large enough for single crystal x-ray work, while the acicular crystals, although usable, were too small for convenience. Equi-inclination Weissenberg photos using a crystal from spec. no. 2 showed the cell to have dimensions: $a=20.82$ (2), $b=5.79$ (1), $c=9.17$ Å (1), and $\beta=91^{\circ}17'$ (3) and the space group to be: $C2$, Cm , or $C2/m$. Numbers in parentheses are standard deviations and refer to the last digits. The cell was refined by least squares from measurements of 58 reflections on zero level photos taken with the crystal mounted on its three crystallographic axes. These photos were calibrated using a quartz single crystal ($a=4.9133$ Å at 25°C) and $\text{CuK}\alpha_1$ radiation ($\lambda=1.5405$ Å). Weissenberg photos of crystals taken from specimens nos. 1 and 2 were indistinguishable.

A powder pattern was taken in a Debye-Scherrer camera with 114.59mm diameter and Straumanis mounting using fibrous material from spec. no. 1 and $\text{CuK}\alpha$ ($\lambda=1.5418$ Å) radiation. Measurements of the stronger reflections from this film are listed and compared to those of Fahey, Daggett, and Gordon (1950) in Table 1. Only the lowest orders could be indexed unambiguously.

The 200 and 20 $\bar{1}$ lines which were not listed by Fahey, Daggett, and Gordon are visible on their published pattern. Intensity differences between the two patterns are to be expected considering the fibrous nature of the material used in the present study and the fact that it was not ground thoroughly enough to make cleavage the dominant factor in determining preferred orientation.

DISCUSSION

The unit cell of wherryite is similar to that of leadhillite (Donnay, Donnay, Cox, Kennard, and King, 1963) except for a halving of a and a reversal of a and b (Table 2). The cell content, Z , of wherryite is 3.57 calculated on the basis of the density and composition determined by Fahey, Daggett, and Gordon. If Z is assumed to be 4 the calculated density is 7.22. Impurities in the sample used for the density measurement must be called on to explain the large discrepancy. A crystal structure analysis has begun.

TABLE 2. COMPARISON OF CRYSTAL DATA FOR WHERRYITE AND LEADHILLITE

	Wherryite	Leadhillite (Donnay <i>et al.</i> , 1963)
a (Å)	20.82	20.70 b (kX)
b (Å)	5.79	11.55 a (kX)
c (Å)	9.17	9.07 c (kX)
β (°)	91.3	90.5
Diffraction aspect	$C^*/*$	$P2_1/c$
ρ (obs). (g/cc)	6.45 (Fahey <i>et al.</i> , 1950)	6.55
Z	4	8
ρ (calc). (g/cc)	7.22	6.57
Composition	$\text{Pb}_4\text{Cu}(\text{CO}_3)(\text{SO}_4)_2(\text{OH}, \text{Cl})_2\text{O}$ (Fahey <i>et al.</i> , 1950)	$\text{Pb}_4(\text{CO}_3)_2(\text{SO}_4)(\text{OH})_2$

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REFERENCES

- DONNAY, J. D. H., G. DONNAY, E. G. COX, O. KENNARD, AND M. V. KING (1963) Crystal Data. *Amer. Crystallogr. Ass. Monogr.* **5**, p. 77.
- FAHEY, J. J., E. B. DAGGETT, AND S. C. GORDON (1950) Wherryite, a new mineral from the Mammoth mine, Arizona. *Amer. Mineral.* **35**, 93-98.
- STRUNZ, H. (1966) *Mineralogische Tabellen*, 4th ed. Akademische Verlagsgesellschaft, Leipzig, 248.

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FERROGLAUCOPHANE FROM NEW CALEDONIA

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ABSTRACT

Ferroglaucophane is described from two localities in Northern New Caledonia. Chemical compositions, unit cell parameters and optical data are given.

Over the past few years there have been a number of publications dealing with the phase relations of the sodic amphiboles, their natural occurrences and correlations of their physical properties with their chemistry (summarized in Ernst, 1968). However, the stable synthesis of the ferrous iron, aluminous end member of the sodic amphibole series has apparently not yet been accomplished (Ernst, 1968, p 92); nor has any natural sodic amphibole been previously recorded which plots within the ferroglaucophane field of Miyashiro's (1957) sodic amphibole classification scheme.

This note reports the discovery of ferroglaucophane in New Caledonian blueschists, and presents chemical and physical data for two ferroglaucophanes. A later more general paper on amphiboles from New Caledonia will discuss the paragenetic significance of the ferroglaucophanes and their relations to the other sodic amphiboles and the physical conditions of blueschist facies metamorphism.

The two described amphiboles are from different lithologies and metamorphic grades.

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