SELIGMANNITE FROM BINGHAM, UTAH

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Seligmannite, a mineral first described and named by Baumhauer[1] and later analyzed by Prior[2] and more fully characterized by Solly[3] is the arsenical equivalent of bournonite, $Cu_2S \cdot 2PbS \cdot As_2S_3$. Hitherto it has been known only from the original locality of the Binnenthal where it has been found in but few examples. The interesting discovery that this rare mineral occurs at Bingham is due to Mr. Lazard Cahn, who identified the mineral and placed the sole specimen in the Holden Collection of Harvard College, giving to the writer the privilege of describing it.

The specimen consists of a small mass of granular pyrite containing two cavities whose walls of crystallized pyrite are coated in turn with sphalerite and splendent tetrahedral crystals of tennantite. Last to form in the cavity are the seligmannite crystals of which there are some twenty-five, the largest not more than 3 mm. in greatest diameter. The crystals are black with a brilliant black fracture and no certain indication of cleavage. The faces of most of the crystals are dull though smooth. A few, however, show excellent, bright faces and six were measured with concordant results. The habit is variable but generally tabular parallel to the base. Most of the crystals seem to be simple twins on *m*(110). Sometimes the members of the twin are of equal size. More often one is dominant and the twinning may be concealed until revealed by measurement and plotting of the position-angles. The figure shows a typical untwinned crystal.

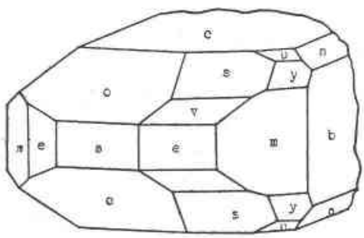

Fig. 1. Seligmannite. Drawing of a crystal showing the forms *c*(001), *b*(010), *a*(100), *e*(210), *m*(110), *n*(011), *v*(211), *y*(111), *s*(212) and *u*(112).

[1] Baumhauer, H., *Sitz.-ber. Akad. Wiss. Berlin*, **1901**, p. 110; **1902**, p. 611.
[2] Prior, G. T., *Mineralog. Mag.*, **XV**, 385, 1908.
[3] Solly, R. H., *Mineralog. Mag.*, **XIII**, 336, 1903; **XIV**, 186, 1905; **XVI**, 282, 1912.

As no table of the position-angles of seligmannite has been published, the values of these angles calculated from the axes of Solly are presented in TABLE I. The crystals from Bingham gave angles agreeing in general very well with these. The best readings from 24 faces of the four forms (110), (111), (121) and (211) were employed for calculation of the axes. The results, compared with the axes of seligmannite established by Solly and with those of bournonite, are as follows:

	SELIGMANNITE BINNENTHAL SOLLY	SELIGMANNITE BINGHAM	BOURNONITE
$a:b:c$	0.9233:1:0.8734	0.9217:1:0.8718	0.9380:1:0.8969
p_0	0.9459	0.9469	0.9562
q_0	0.8734	0.8718	0.8969

The forms found on each of the six crystals measured are shown in TABLE II.

It will be noted that the pinacoids *c*(001) and *a*(100) are practically always present as are the prisms *e*(210), *m*(110) and *i*(130); the orthodome *o*(101) and the pyramids *v*(211), *y*(111), and *s*(212).

The forms described as new are for the most part weak faces but the signals reflected by them were as good as those from many of the established forms. The data on which they rest are as follows:

	MEASURED ϕ	MEASURED ρ	CALCULATED ϕ	CALCULATED ρ
Γ(830)	70°58′	90°00′	70°54′	90°00′
Λ(430)	56 43	90 00	55 18	90 00
Ξ(430)	38 36	90 00	39 05	90 00
	38 04	90 00		
ψ(122)	27 29	45 17	28 26	44 48
σ(232)	35 44	58 22	35 50	58 15
	36 30	59 00		
υ(8.11.3)	38 43	76 10	38 14	76 13

In order to confirm the nature of these crystals as seligmannite, tests were made for arsenic. A crystal heated in the open tube gave a typical arsenic sublimate and the odor of arsenic oxide. Microchemical tests gave a decisive reaction for arsenic and failed to reveal even a trace of antimony. I am indebted to Dr. Short and Mr. Berman for making these tests. Material is lacking for a quantitative analysis without sacrificing the whole specimen which under the circumstances seemed unnecessary.

I. Angle Table of Seligmannite.

$a:b:c = .9233:1:.8734$ (Solly) $p_0 = .9459$ $q_0 = .8734$

			ϕ	ρ				ϕ	ρ
c	0	001	0° 00′	0°00′	D	$\frac{3}{2}1$	322	58 23	48 00
b	0∞	010	0 00	90 00	v	21	211	65 13	64 22
a	$\infty 0$	100	90 00	90 00	y	1	111	47 17	52 10
E	6∞	610	81 15	90 00	M	$\frac{2}{3}1$	233	35 50	47 08
q	5∞	510	79 32	90 00	Ψ	$\frac{1}{2}1$	122	28 26	44 48
A	4∞	410	77 00	90 00	O	$1\frac{1}{3}$	313	72 53	44 42
η	3∞	310	72 53	90 00	s	$1\frac{1}{2}$	212	65 13	46 10
Γ	$\frac{8}{3}\infty$	830	70 54	90 00	N	$1\frac{2}{3}$	323	58 23	48 00
e	2∞	210	65 13	90 00	σ	$1\frac{3}{2}$	232	35 50	32 52
l	$\frac{3}{2}\infty$	320	58 23	90 00	ω	1 2	121	28 26	63 17
Λ	$\frac{4}{3}\infty$	430	55 18	90 00	L	1 3	131	19 51	70 15
k	$\frac{5}{4}\infty$	540	53 33	90 00	K	1 6	161	10 14	79 22
m	∞	110	47 17	90 00	β	1 8	181	7 43	81 56
Ψ	$\infty\frac{5}{4}$	450	40 55	90 00	ℌ	4	441	47 17	79 00
Ξ	$\infty\frac{4}{3}$	340	39 05	90 00	𝔊	3	331	47 17	75 29
f	$\infty 2$	120	28 26	90 00	u	$\frac{1}{2}$	112	47 17	32 46
i	$\infty 3$	130	19 51	90 00	ϕ	$\frac{1}{3}$	113	47 17	23 14
Φ	$\infty 4$	140	15 09	90 00	𝔉	$\frac{2}{9}$	229	47 17	15 58
α	$\infty 6$	160	10 14	90 00	Π	$\frac{1}{2}\ \frac{3}{2}$	132	19 51	54 19
Θ	$\infty 8$	180	7 42	90 00	τ	$\frac{1}{2}\ 5$	1.10.2	6 11	77 10
κ	$0\frac{1}{3}$	013	0 00	16 14	Y	$\frac{3}{2}\ \frac{1}{2}$	312	72 53	56 02
g	$0\frac{2}{5}$	025	0 00	19 15	X	$\frac{7}{3}\ \frac{1}{2}$	14.3.6	78 48	66 02
n	01	011	0 00	41 08	V	$6\frac{1}{2}$	12.1.2	85 36	80 02
z	02	021	0 00	60 12	ι	$\frac{2}{3}\ \frac{1}{3}$	213	65 13	34 47
Σ	03	031	0 00	69 07	U	$\frac{4}{3}\ \frac{1}{3}$	413	77 00	52 19
F	06	061	0 00	79 12	T	$2\frac{1}{3}$	613	81 15	62 25
B	07	071	0 00	80 42	S	$\frac{7}{3}\ \frac{1}{3}$	713	82 29	65 48
Δ	$\frac{1}{5}0$	105	90 00	10 43	δ	$\frac{7}{2}\ \frac{5}{2}$	752	56 36	75 51
t	$\frac{1}{4}0$	104	90 00	13 18	π	$\frac{9}{2}\ \frac{7}{2}$	972	54 19	79 12
ϵ	$\frac{1}{3}0$	103	90 00	17 30	ν	$\frac{8}{3}\ \frac{11}{3}$	8.11.3	38 14	76 13
x	$\frac{1}{3}0$	102	90 00	25 18	ξ	3 4	341	39 05	73 50
h	$\frac{2}{3}0$	203	90 00	32 14	ζ	4 5	451	40 55	80 11
o	10	101	90 00	43 24	μ	5 6	561	42 04	81 56
I	20	201	90 00	62 08	λ	7 8	781	43 28	84 03
H	$\frac{7}{3}0$	703	90 00	65 38	W	4 3	431	55 18	77 44
G	60	601	90 00	80 00	γ	5 4	541	53 33	80 21
Ω	14.1	14.1.1.	86°13′	85°41′	J	6 5	651	52 25	82 03
Υ	$\frac{11}{2}1$	11.2.2.	80 28	79 16	Z	2 6	261	19 51	79 49
C	31	311	72 53	71 23					
P	61	611	81 15	80 07					
Q	$\frac{7}{3}1$	733	68 25	67 09					
R	$\frac{5}{3}1$	533	61 01	60 59					

Table II. Combinations of Forms, Seligmannite, Bingham

	c	b	a	q	A	Γ	e	l	Λ	m	Ξ	f	i	Φ	Θ	κ	n	z	Σ	o	v	y	Ψ	s	σ	ρ		u	φ	υ	W
1.	x		x		x		x	x		x			x							x	x	x		x					x		x
2.		x	x		x		x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x			
3.	x	x	x				x			x	x	x	x							x	x	x									
4.	x	x	x				x			x		x					x			x	x	x		x				x			
5.	x		x		x	x	x	x		x	x		x		x	x				x	x	x		x	x			x	x	x	x
6.	x		x	x	x		x		x	x	x	x	x	x	x	x	x			x	x	x		x		x		x	x		