Analyses of Seligmannite, zinciferous Tennantite ('Binnite'), and Fuchsite from the Lengenbach quarry, Binnenthal.[1]

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(1) The chemical composition of Seligmannite.

THE crystallographic and other physical characters of seligmannite from the well-known quarry in the Lengenbach, Binnenthal, were first described by Professor Baumhauer in 1901.[2] In its crystallographic characters the mineral was found to be closely allied to bournonite, which it resembled in the habit of the crystals and the repeated twinning on the prism-planes. The axial ratios for the two minerals as given by Baumhauer are:—

Seligmannite, $a : b : c = 0{\cdot}92804 : 1 : 0{\cdot}87568$

Bournonite, $a : b : c = 0{\cdot}93798 : 1 : 0{\cdot}89688$

Seligmannite was therefore regarded by Baumhauer as isomorphous with bournonite, and as being probably the corresponding arsenic compound having the formula $Cu_2S.2PbS.As_2S_3$. The amount of material at his disposal seems to have been insufficient for a chemical examination. Small crystals, however, which were found on dufrenoysite and described in 1902[3] by Mr. R. H. Solly, were tested at Cambridge by Dr. H. J. H. Fenton and found to contain copper, lead, sulphur, and arsenic. Since that time a few more crystals of this rare mineral, including the large crystal described in 1905,[4] have been found by Mr. Solly. On this material the two following quantitative chemical analyses have been made, the result of which has been to confirm completely Baumhauer's suggestion as to the isomorphism of seligmannite and bournonite.

The first analysis (I) was made on crystal fragments picked out by Mr. Solly, and the second (II) on a portion of the large crystal previously mentioned.

[1] Communicated by permission of the Trustees of the British Museum.

[2] H. Baumhauer, Sitzungsber. Akad. Wiss. Berlin, 1901, pp. 110–117.

[3] R. H. Solly, Mineralogical Magazine, 1903, vol. xiii, pp. 336–339.

[4] R. H. Solly, Mineralogical Magazine, 1906, vol. xiv, pp. 186–187.

The results of the analyses are as follows:—

	I.	Atomic ratios.	II.	Atomic ratios.
Pb	46·34	0·225	48·83	0·236
Cu	13·09	0·208	10·51	0·164
Ag	0·11	0·001	0·23	0·002
Zn	0·27	0·004	—	—
Fe	0·06	—	0·80	0·015
As	16·88	0·225	16·94	0·226
Sb	0·64	0·005	0·71	0·006
S	21·73	0·677	22·01	0·705
	99·12		100·03	

The weight of the material used in I was 0·5187 gram, and its specific gravity 5·44; the weight used in II was 0·5432 gram, and its specific gravity 5·48.

The result of analysis I agrees very closely with the formula $2PbS.Cu_2S.As_2S_3$, that of II not quite so closely; but there is reason to suppose that the material of the large crystal used in II was not so pure as the crystal fragments used in I. The analyses, without doubt, confirm the idea suggested by the crystallographic characters of the mineral that seligmannite is the arsenic analogue of the sulph-antimonite bournonite.

(2) Analysis of zinciferous Tennantite ('Binnite').

Amongst other specimens found by Mr. Solly some years ago at the Lengenbach quarry, was a large cubic crystal with faces about 15 mm. across, and deeply striated parallel to their intersections with small tetrahedral faces. Other crystals were afterwards found presenting similarly striated cube-faces, but with the tetrahedral planes more fully developed. In the development of the faces, therefore, the mineral differs from the ordinary tennantite or binnite of the Binnenthal, and a chemical analysis seemed desirable. The result of the analysis which was made is as follows:—

	I.	II.	Combined.	Atomic ratios.
Cu	42·03	—	42·03	0·670
Ag	—	1·24	1·24	0·011
Zn	—	7·76	7·76	0·119
Fe	—	0·62	0·62	0·011
As	19·80	—	19·80	0·265
S	—	28·08	28·08	0·878
			99·53	

The weight of material used in I was 0·2367 gram; in II, 0·5089 gram. The specific gravity was 4·61.

The analysis shows that the mineral is tennantite containing a large percentage of zinc, to which possibly the unusual habit of the crystals may be due.

The mineral is referred to in Léon Desbuissons's 'La Vallée de Binn', 1909, pp. 124, 184.

(3) Analysis of Muscovite (Fuchsite).

This mineral is referred to in Léon Desbuissons's 'La Vallée de Binn', 1909, pp. 65, 164, 184. It occurs at the Lengenbach quarry as clear green crystals in the dolomite.

The material for the following analysis was supplied by Mr. Solly. The result is as follows:—

SiO_2	47·24
Al_2O_3	31·86
Cr_2O_3	0·87
FeO	0·56
CaO	0·58
MgO	2·91
K_2O	10·72
Na_2O	0·16
Li_2O	0·14
Loss on ignition ...	5·37
	100·41

The weight of material used in the main analysis was 0·5010 gram; for alkalis, 0·4192 gram. The Cr_2O_3 was determined colorimetrically.