NOTES AND NEWS

A COBALT-NICKEL-COPPER SELENIDE FROM THE GOLDFIELDS DISTRICT, SASKATCHEWAN[1]

S. C. Robinson and E. J. Brooker

Geological Survey of Canada, Ottawa, Canada.

A number of small deposits of selenide minerals in the Goldfields District, Saskatchewan have been reported by the senior author (Robinson *Geol. Surv., Canada*, Paper 50-16, 1950). In two of these deposits, disseminated grains and small masses of a mineral ressembling pentlandite were recognized. Enough of this mineral has now been segregated to provide data for this preliminary description.

The deposits in which the mineral was found consist primarily of umangite, with minor klockmannite and traces of berzelianite, clausthalite pyrite, hematite and chalcopyrite. These minerals occur cementing the sheared and fractured host rocks and their principal alteration product is chalcomenite. Quartz is the only introduced gangue mineral and is present in very small amount. The cobalt-nickel-copper selenide is veined, embayed and replaced by umangite so that segregation of pure material is a difficult and tedious process.

Grains of the mineral are usually rounded, but a few of them show subhedral development of the cube. Crushed products contain both cubic fragments and others showing conchoidal fracture; it is probable that there is poor cubic cleavage. The mineral is brittle with a hardness of about $3\frac{1}{2}$. Specific gravity of 6.6 ± 0.2 was determined by use of a modification to the Berman balance on 7.42 milligrams of finely-divided, picked material. The mineral has a metallic lustre, is light bronze in colour and yields a black streak. It is opaque even on thin edges. In polished section, it is isotropic and its colour is light brassy bronze. Positive microchemical tests for copper, cobalt, nickel and selenium were obtained using methods described by Short (1950).

X-ray powder patterns of material from both occurrences and of pentlandite from the Worthington mine, Sudbury, Ontario, are reproduced in Fig. 1. The material used for specific gravity and *x*-ray fluorescence analysis determinations, corresponds to pattern No. 2 and comes from the western part of the Eagle group of claims. Material represented in pattern No. 1 comes from a deposit at the head of Ato Bay, on Beaverlodge Lake. The relative intensities, glancing angles and spacings for all lines on pattern No. 1 and pentlandite are given in Table 1, together with

[1] Published by permission of the Director-General of Scientific Services, Department of Mines and Technical Surveys, Ottawa, Canada.

TABLE 1. *X*-RAY POWDER PATTERNS*

Cobalt—Nickel—Copper Selenide $a_0=10.005\pm0.004$ A					Pentlandite Worthington Mine, Algoma Dist. $a_0=10.042\pm0.005$ A			
I	2θ Cu	*d*(meas)	*hkl*	*d*(calc)	*I*	2θ Cu	*d*(meas)	*d*(calc)
4	15.33	5.780	111	5.776	3	15.33	5.780	5.798
			002		½	17.71	5.009	5.021
4	25.18	3.537	022	3.537	½	25.12	3.545	3.550
½	26.61	3.350	003	3.335				
½	28.03	3.183	013	3.164				
6	29.62	3.016	113	3.017	8	29.50	3.028	0.028
7	30.99	2.886	222	2.888	4	30.88	2.896	2.899
9	35.90	2.501	004	2.501	½	35.76	2.511	2.511
1	39.24	2.296	133	2.295	3	39.15	2.301	2.304
			024		½	40.07	2.250	2.245
1	44.37	2.042	224	2.042				
6	47.20	1.926	115; 333	1.926	5	47.06	1.931	1.928
10	51.68	1.769	044	1.769	10	51.49	1.775	1.775
1	54.19	1.693	135	1.691	½	54.04	1.697	1.697
1	60.65	1.527	335	1.526	1	60.50	1.530	1.528
4	61.44	1.509	226	1.508	1	61.23	1.514	1.514
4	64.51	1.445	444	1.444				
2	66.70	1.402	155	1.401				
1	70.22	1.340	246	1.337				
2	72.46	1.304	355	1.303	2	72.27	1.307	1.307
3	75.97—	1.253	008	1.251	2	75.78	1.255	1.252
1	78.09	1.224	337	1.222				
½	81.50	1.181	228; 066	1.179	½	83.29	1.160	1.183
1	83.65	1.156	157; 555	1.155				
1	84.26	1.149	266	1.148				
4	86.94—	1.121	048	1.119				
1	89.07	1.099	119; 357	1.098	½	88.50	1.105	1.102
2	94.43	1.050	139	1.049	½	94.11	1.052	1.053
4	97.74	1.023	448	1.021	2	97.47	1.025	1.025
½	99.89	1.006	177; 339	1.006				
3	105.45	0.9680	159; 377	0.9672	½	105.08	0.9704	0.9708
½	111.17	0.9337	468	0.9290				
2	120.89	0.8855	088	0.8843	½	120.35	0.8878	0.8876
2	123.34	0.8751	179	0.8741				
½	127.95	0.8572	0.6.10; 668	0.8582				
½	130.06	0.8497	3.3.11; 379	0.8496				
½	130.91	0.8466	2.6.10	0.8456				
2	134.67	0.8347	488	0.8338				
½	137.62	0.8261	777	0.8252				
1	142.89	0.8125	2.2.12	0.8115				
1	146.29	0.8048	579	0.8036	½	145.40	0.8068	0.8047
4	153.06	0.7920	0.4.12	0.7910	1	151.86	0.7941	0.7939
1	158.92	0.7835	0.8.10; 688	0.7813				

* Radiation Cu; $\lambda=1.5418$ A, $2\theta<90$, $\lambda=1.54050$ A, $2\theta>90$, Camera 114.58 mm. Film shrinkage correction applied.

the indices for the corresponding planes and calculated spacings for the mineral being described. All lines in the powder patterns conform to a face-centred cubic lattice with a cell edge (a_0) of 10.005 ± 0.005 A. For pattern No. 1, this value is 10.004 ± 0.005 A, for pattern No. 2 it is 10.006 ± 0.004 A and for the pentlandite specimen it is 10.042 ± 0.004 A.

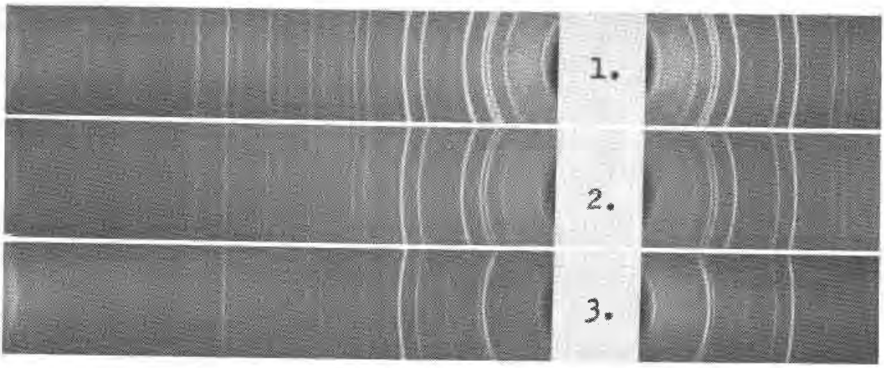

FIG. 1. *X*-ray powder photographs, filtered CuK radiation (contact prints $1°\theta = 1$ mm on film) 1 & 2 Cobalt-nickel-copper selenide; Ato Bay and Eagle group, Goldfields district, Saskatchewan. 3. Pentlandite, Worthington mine, Sudbury Ontario.

Systematically missing spectra indicate that the space group is *Fm3m*.

A preliminary *x*-ray fluorescence analysis indicates that the composition conforms to the approximate atomic formula $Co_{3.0}$ $Ni_{2.0}$ $Cu_{3.5}$ $Se_{9.5}$. It is probable that cobalt, nickel and copper may substitute for each other in varying amount and that the mineral may conform to a general formula of the *RX* type. Search of the literature has not disclosed any mineral whose chemical and structural features approach closely those here described; Penroseite has a unit cell of 6.01 ± 0.01 (Bannister & Hey, *Am. Mineral.*, **22**, 319–324, 1937), and a composition conforming to the general type RX_2.

A complete chemical analysis of this mineral is to be made, that will permit calculations of the contents of the unit cell and of the specific gravity. Until this more complete description is available, it would be premature to suggest a name for this mineral.

AUTORADIOGRAPHS AS A MEANS OF STUDYING DISTRIBUTION OF RADIOACTIVE MINERALS IN THIN SECTION[1]

S. C. ROBINSON, *Geological Survey of Canada, Ottawa, Canada.*

This note describes a simple method of recognizing those grains in a thin section, that contribute to its radioactivity. General information on the subject of detecting and measuring alpha radiation by means of nuclear emulsions is fully described by Yagoda (*Radioactive Measurements with Nuclear Emulsions* 1949), and some ingenious applications of the method to the study of radioactive minerals, by Stieff & Stern

[1] Published by permission of the Director-General of Scientific Services. Department of Mines and Technical Surveys, Ottawa, Canada.