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Lab No. 221

PETROGRAPHIC REPORT
LUCIUS PITKIN, INC. PETROGRAPHIC-MINERALOGICAL LABORATORY

Request submitted by: Robert T. Russell, Geologic Studies, RID

SECONDARY COBALT MINERALS FROM TEMPLE MOUNTAIN, UTAH

Sample Location - AAA 050 - Emery County, Utah

Mine or Claim Group - Calyx Bench

Formation & Member - Mossback Member of Chinle Formation (Triassic)

Cobaltimenite occurs with quartz grains as rose-colored coatings and crack fillings in a dolomitic sandstone. Cobaltimenite is a dihydrated selenite ($(Co,Ni)SeO_3.2H_2O$), where cobalt is in excess of nickel. Identification was made by comparison of X-ray powder diffraction data with that of natural and synthetic ahlfeldite $(Ni,Co)SeO_3.2H_2O$. The diffraction patterns of the two synthetic end members, $CoSeO_3.2H_2O$ and $NiSeO_3.2H_2O$, and natural ahlfeldite are supposedly essentially the same. The existence of a natural selenite with cobalt in excess of nickel has not yet been proven, however.[1] A possible occurrence of cobaltimenite has been reported from Cerro de Cacheuta, Mendoza, Argentina, where it was found associated with chalcomenite ($CuSeO_3.2H_2O$) and molybdomenite ($PbSeO_3$) as an alteration product of selenides.[2] Another occurrence has been reported from Pakajake, Bolivia, where it is associated with chalcomenite as an alteration product of penroseite ($(Ni,Cu)Se_2$).[3] Ahlfeldite was also found at the same locality.[1]

No selenides were identified in the sample.

The cobaltimenite in this sample contains cobalt in excess of nickel by two or three to one (see Table I, Assay and Table II, Spectrographic Analysis).

The yellow to red crusts were identified also by X-ray diffraction as cobaltimenite, although here it is probably somewhat altered.

A pink, powdery effluorescence developed on the rock and was identified as aplowite ($CoSO_4.4H_2O$). It is similar to bieberite ($CoSO_4.7H_2O$) and moorhouseite ($CoSO_4.6H_2O$). The only other known occurrence of aplowite is from Walton, Nova Scotia, where it is associated with moorhouseite as a probable alteration product of a cobaltian-nickelian pyrite.[4]

Examined by: John V. Heyse
John V. Heyse, Jr. Petrologist

Approved by: A. Gene Sidler
A. Gene Sidler, Sr. Petrologist

5-6-69

LITERATURE CITED

1. G. Gattow and O. J. Lieder, The American Mineralogist, v.48, p.1183, 1963.

2. C. Palache, H. Berman and C. Frondel, Dana's System of Mineralogy, v.2, p. 639, 1951.

3. C. Palache, Chalcomenite from Bolivia, The American Mineralogist, v.22, pp. 791-5, 1937.

4. J. L. Jambor and R. W. Boyle, The American Mineralogist, v.50, p. 809, 1965

TABLE I

RAPID ROCK ANALYSIS

	%Al_2O_3	%CaO	%CO_2	%FeO	%Fe_2O_3	%MgO	%MnO	%K_2O	%Na_2O	%P_2O_5	%SiO_2	%S	%SO_4	%TiO_2	LOI
AAA 050	3.3	0.20	0.22	0.16	0.30	0.05	Nil	0.90	0.09	0.06	89.52	0.33	0.15	0.40	5.21

ASSAY

	ppmCr_2O_3	ppmU_3O_8	%Ba	%V_2O_5	%$CaCO_3$	%Cu	%Br	%Co	%Ni	ppmAs	%Se	%F	ppmZn	ppmPb
AAA 050	30	42	0.04	0.05	0.4	0.09	Nil	0.12	0.05	180	0.81	0.01	Nil	70

TABLE II

SPECTROGRAPHIC ANALYSES

	AAA 050	Rose Crusts on Qtz
% Si	+10	Major
Al	2.	Minor
Fe	.3	Trace
Ti	.05	Trace
Mn	.002	Nil
P	0	Trace
Ca	.3	Minor
Mg	.1	Minor
Na	.1	Nil
K	1.	NLF
As	.1	Nil
B	.002	NLF
Ba	.03	NLF
Be	0	NLF
Co	.15	Major
Cr	.003	Nil
Cu	.002	Nil
Li	0	NLF
Mo	0	Nil
Ni	.05	Minor
Pb	.007	Trace
Sr	0	NLF
V	.04	Trace
Zr	0	Nil
Ag	0	NLF
Sb	0	NLF
Zn	0	Nil
Ga	.001	NLF
Y	0	NLF

TABLE III

DIFFRACTION DATA FOR ROSE CRUSTS ON QUARTZ

FILM NO. 267		QUARTZ		AHLFELDITE (NAT.)		AHLFELDITE (SYN.)	
dA	I/I_1	dA	I/I_1	dA	I/I_1	dA	I/I_1
7.5894	10						
7.1898	15						
5.7266	50			5.72	100	5.63	100
5.2852	15			5.26	10	5.24	15
4.5208	15						
4.3666	15			4.43	10		
4.2427	30	4.26	35				
4.0241	20			4.00	20	3.90	20
3.7856	25			3.77	30	3.76	35
3.7002	4						
3.5546	12						
3.4462	25			3.40	40	3.42	65
3.3261	100	3.343	100				
3.2314	15					3.20	20
3.1410	12						
3.0670	4						
2.9965	30			2.98	70	2.98	45
2.9340	10						
2.7249	25			2.72	20	2.70	35
2.6496	12			2.63	10	2.62	15
2.5335	12			2.53	10		
2.4859	15			2.47	10	2.47	25
2.4466	15	2.458	12				
2.3593	20			2.35	20	2.34	35
2.2733	20	2.282	12				
2.2328	15	2.237	6				
2.1892	20			2.20	40	2.18	30
2.1537	8						
2.1195	12	2.128	9				
2.0755	8						
2.0204	10						
1.9705	15	1.980	6				
1.9194	10						
1.8114	25	1.817	17				
1.7220	20						
1.6868	8	1.672	7				

Continued next page

TABLE III CONT'D

FILM NO. 267		QUARTZ		AHLFELDITE (NAT.)		AHLFELDITE (SYN.)	
dA	I/I_1	dA	I/I_1	dA	I/I_1	dA	I/I_1
1.6684	10	1.659	3				
1.6369	10						
1.5878	12						
1.5582	8						
1.5347	25	1.541	15				
1.4858	12						
1.4615	4						
1.4463	6	1.453	3				
1.4275	4						
1.4084	4						
1.3764	15	1.382	7				
1.3691	25	1.375	11				
		1.372	9				
1.3535	8						
1.2832	8	1.288	3				
1.2542	12	1.256	4				
1.2269	8	1.228	2				
1.1959	12	1.1997	5				
1.1789	12	1.1802	4				
1.1500	4	1.1530	2				
1.1174	4	1.1144	<1				

TABLE IV

DIFFRACTION DATA FOR POWDERY PINK EFFLUORESCENCE

FILM NO. 265		QUARTZ		APLOWITE	
dA	I/I_1	dA	I/I_1	dA	I/I_1
7.2842	10				
6.8042	50			6.82	35
				6.77	14
5.4333	70			5.44	85
				5.14	10
4.7260	25			4.72	14
4.4445	100			4.46	100
4.2247	30	4.26	35		
3.9378	60			3.94	50
3.7792	10			3.79	2
3.5984	15			3.59	10
				3.41	4
3.3959	35			3.39	35
3.3273	95	3.343	100		
				3.28	4
3.2616	10			3.26	10
3.2086	30			3.21	30
2.9539	60B			2.967	16
				2.943	30
2.8978	10			2.899	6
2.7667	15			2.761	4
				2.752	4
2.7088	10			2.716	6
2.6466	6			2.648	2
2.5587	30			2.562	20
2.4505	15	2.458	12		
2.4155	20			2.412	14
2.3480	15B			2.346	8
				2.359	12
2.2684	30B	2.282	12	2.258	14

Continued next page

TABLE IV CONT'D

FILM NO. 265 dA	FILM NO. 265 I/I_1	QUARTZ dA	QUARTZ I/I_1	APLOWITE dA	APLOWITE I/I_1
2.2202	15	2.237	6	2.229	6
2.1741	8				
2.1252	10	2.128	9	2.128	4
2.0965	10			2.107	6
2.0491	8			2.040	2
				1.973	4
1.9669	20B	1.980	6	1.965	2
				1.958	10
				1.957	6
1.9371	4			1.937	6
1.9121	8			1.916	4
1.8747	10			1.883	10
				1.864	4
1.8549	10			1.860	4
				1.849	2
1.8124	20	1.817	17		
1.7901	15			1.792	10
1.7486	10			1.750	4
1.7134	10			1.718	6
1.6659	12	1.672	7		
1.6279	10			+22 lines	
1.5681	10			to 1.502	
1.5384	15	1.541	15		
1.5067	15				
1.4797	10				
1.4445	15	1.453	3		
		1.378	11		
1.3702	20B	1.372	9		
1.3040	6				
1.2826	20	1.288	3		
1.2522	10	1.256	4		
1.2229	10	1.228	2		
1.1954	15	1.1997	5		
1.1779	15	1.1802	4		