ART. XLIV.—*Analyses of three Descloizites from new Localities*; by W. F. HILLEBRAND.

[Read before the Colorado Scientific Society, Mar. 4th, 1889.]

1. *Mayflower Mine, Bald Mountain Mining District, Beaverhead County, Montana.*

THROUGH Messrs. W. H. Beck and George E. Lemon of Washington, D. C., was received about a year ago for examination a large lump of friable, uncrystallized material, having a dull yellow to pale orange color, and consisting chiefly of a vanadate, but carrying a large percentage of gangue. Two samples as pure as could be selected from different parts of the lump were analyzed with the following results:

	I.	II.	Mean.	Molecular ratios.	
PbO	56.02	55.84	55.93	.2508	
CuO	1.16	1.13	1.15	.0145	
FeO	0.70	0.70	0.70	.0097	
ZnO	15.96	15.91	15.94	.1968	
V ₂ O ₅	----	20.80	20.80	.1140	
As ₂ O ₅	0.32	----	0.32	.0014	
P ₂ O ₅	0.27	----	0.27	.0019	
H ₂ O	4.37	4.36	4.37	.2428	
SiO ₂	0.20	0.16	0.18		
CaO	0.10	----	0.10		
MgO	0.06	----	0.06		
			99.82		

From I 27.62 per cent of gangue insoluble in cold dilute nitric acid has been deducted, and from II 22.20 per cent; manganese was present in the gangue in small quantity, apparently as pyrolusite, but it was not dissolved by the acid. The insoluble portion was found also to retain very small quantities

of lead and zinc, which were estimated and included in the analysis as probably belonging to the vanadate. The water had to be estimated indirectly by deducting from the total amount of water afforded by the dried mixture of vanadate and gangue that belonging to the latter alone, which was found as follows. The mixture, dried at 100°C. , was dissolved in cold dilute nitric acid, and the insoluble matter collected in a Gooch crucible was dried at the same temperature and then ignited. The loss on ignition gave the water in the gangue, there being no ferrous iron in the latter to influence the result. The traces of SiO_2 , CaO and MgO may be neglected as probably derived from the gangue. The water, it will be noticed, is double that required by descloizite, $\text{R}_2(\text{OH})\text{VO}_4$, but in view of the liability to error inherent in the method of water estimation employed this is not deemed sufficient cause for separating the mineral from descloizite, although the close agreement of the two water determinations, made as they were on samples containing different proportions of gangue, would indicate the correctness of the formula $2[\text{R}_2(\text{OH})\text{VO}_4] + \text{H}_2\text{O}$.

Other specimens have since been received from the above named persons in which the earthy vanadate was associated sometimes with compact cerussite and galena in process of alteration. A dull reddish substance which constituted a part or even the whole of some lumps contained, besides silica, iron and some antimony in an oxidized condition, but carried little or no vanadium.

Professor F. A. Genth has already called attention* to the occurrence of vanadinite and probably of descloizite in the Bald Mountain mine, Beaverhead County, Montana. His specimens, however, showed the supposed descloizite as a pale brownish crystalline coating on yellow ferruginous quartz, whereas the present mineral shows no evidence of crystalline structure.

2. Commercial Mine, Georgetown, Grant County, New Mexico.

This is one of the most interesting occurrences of descloizite known, because of the extreme brilliancy of coloring of the mineral. The ore bodies in the Commercial mine, as well as in the adjoining MacGregor and Naiad Queen mines, occur in limestone immediately under an overlying slate, and appear to narrow in depth where certain eruptive dikes cut through the lime, as Mr. MacIntosh, foreman of the Commercial mine, informed me. The absence of the superintendents of the several mines and the very brief visit I was forced to make prevented obtaining more certain and detailed information.

* Proc. Am. Phil. Soc., xxiv, 38, 1887.

In places where the rock is most fractured and crushed the descloizite appears in greatest quantity and finest condition as an incrustation on quartz, often covering large surfaces, and in color varying from yellow through all shades of orange-red to deep reddish brown, the last named colors predominating. The black color so frequent in descloizite from Lake Valley, New Mexico, caused by a superficial coating or admixture of pyrolusite, is so far as my observation extended, wanting, hence specimens from Georgetown are likely to be much sought after for their showy appearance. A specimen in one of the banks at Silver City, New Mexico, taken from one of the Georgetown mines, resembled a stalactite in form. It was probably fully three feet in height by six to eight inches or more in diameter, and was deep reddish brown in color.

The incrustations are for the greater part distinctly crystalline and are generally made up of aggregates of more or less globular forms of a size ranging from microscopic to a diameter of one or two millimeters. Each of these is composed of a great number of apparently flat crystals, intergrown, and projecting sufficiently from the surface to give brilliant reflections when observed under the lens, and to the naked eye a frosted appearance where the globular growths are largest. The richest reddish brown color is always coincident with this development in size. The globular character changes frequently to acicular. In such cases the incrustation seems to have originally formed on bunches of radiating acicular, almost colorless, vanadinite, which frequently appears thus coating the quartz and running under the descloizite incrustations. Sometimes the vanadinite has entirely disappeared, and then there may be a hollow through the center of the descloizite needle.

The occurrence of vanadate of lead in the MacGregor mine at Georgetown has been noticed by Professor Genth (l. c., p. 38). The specific gravity of the mineral was not determined; the hardness is about 3.5; the color of the powder is orange-yellow. An analysis gave the following results after deducting 11.91 per cent of insoluble matter, almost entirely quartz.

Molecular ratios.					
PbO	56.01	.2512	} 4843	.4788	4.12
CuO	1.05	.0132			
FeO	0.07	.0010			
ZnO	17.73	.2189			
V ₂ O ₅	20.44	.1119	} 1178	.1162	1.00
As ₂ O ₅	0.94	.0041			
P ₂ O ₅	0.26	.0018			
H ₂ O	2.45	.1361	----	.1361	1.17
Cl	0.04	.0011			
SiO ₂	1.01				
CaO	0.04				
MgO	0.03				
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	100.07				

The third column of molecular ratios gives those values after allowing for admixed vanadinite calculated on the basis of the chlorine found. A further correction has probably to be made for an admixed soluble hydrous (zinc ?) silicate, which might make the ratio approximate more closely to 4 : 1 : 1.

3. *Lucky Cuss Mine, Tombstone, Cochise County, Arizona.*

Mr. W. F. Staunton, Superintendent of the Tombstone Mining and Milling Co., and Mr. Frank C. Earle, assayer at Tombstone, kindly placed at my disposal for examination specimens of a vanadium mineral the identity of which had not been established. It was found in the Lucky Cuss mine as an incrustation, sometimes half an inch thick, on quartz, showing more or less botryoidal surfaces of an indefinable dull greenish color. On a fractured surface the color is brown; the luster is resinous; the structure granular, only occasionally diverging fibrous; the hardness 3·5; the specific gravity of sample analyzed, containing a little impurity, 5·88 at 19° C.; color of powder lemon-yellow. Analysis gave the following results after deducting 0·67 per cent of insoluble matter.

			Molecular ratios.		
PbO	57·00	·2556	} 4485	·4385	3·93
CuO	11·21	·1412			
FeO	trace.	----			
ZnO	4·19	·0517	} 1145	·1115	1·00
V ₂ O ₅	19·79	·1084			
As ₂ O ₅	1·10	·0048			
P ₂ O ₅	0·19	·0013	} ----	·1389	1·25
H ₂ O	2·50	·1389			
Cl	0·07	·0020			
SiO ₂	0·80				
CaO	1·01				
MgO	0·04				
K ₂ O	0·10				
Na ₂ O	0·17				
CO ₂	0·82				
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98·99					

The low total is probably owing to a loss of zinc during analysis. Calcite was present as an impurity, and as the CO₂ just suffices for the CaO and MgO these are rejected in considering the composition of the vanadate. The figures in the third column of molecular ratios are found by allowing for probably admixed vanadinite calculated from the chlorine found. In another specimen a qualitative test for chlorine indicated a greater admixture of vanadinite. As in the case of the descloizite from Georgetown, New Mexico, previously described, a further allowance has perhaps to be made for a soluble hydrous silicate. There can be no doubt that the general formula for the vanadate is that of descloizite.

In almost every respect this mineral resembles, so far as the published descriptions allow of judging, the descloizite of Penfield,* the cupro-descloizite of Rammelsberg,† and the ramirite of de Leon,‡ perhaps also the tritochorite of Frenzel,§ to the similarity of which with his variety of descloizite Penfield draws attention in his paper. Professor Genth's surmise (l. c., p. 39) of the specific identity of all these substances seems highly probable. Characteristic for the present variety is the greater replacement of the lead-zinc vanadate—true descloizite—by the isomorphous lead-copper vanadate, and the lessened tendency toward a fibrous structure, which in the other varieties described seems to be a decidedly pronounced feature. Possibly this last characteristic of the Tombstone mineral, if it be not accidental in view of the few specimens (three) examined, is a condition of the first.

According to Rammelsberg,|| the lead-copper vanadate corresponding to the lead-zinc vanadate (descloizite) is mottramite or psittacinite, though it seems not improbable that it may be the chileite of Dana's Mineralogy. Domeyko's analyses,¶ which led Kenngott to ascribe the above name to the Chilean mineral, show a deficiency of 2.5 and 2.8 per cent, which may very well be V_2O_5 . At all events, a recalculation of his analyses based on this assumption leads to a proportion for $PbO + CuO : V_2O_5 : H_2O$ of nearly 4 : 1 : 1.

In view of the well defined character of all these highly cupriferous varieties of descloizite it would be well to designate them once for all by some distinctive name. Tritochorite would have precedence if the substance to which that name has been given is really identical with the others, but Rammelsberg's cupro-descloizite is more appropriate as indicating at once the relationship to descloizite, and I would suggest that it be henceforth used for all cupriferous descloizites showing the physical characteristics of the mineral above described.

NOTE.—Since the foregoing was written there has appeared in the Bull. Soc. Franc. Min., Feb., 1889, p. 38, a paper by F. Pisani, in which he gives another analysis of the Mexican cupro-descloizite and discusses briefly the relations of various vanadates. The essential identity of all the above enumerated cupriferous lead-zinc vanadates, with the addition of another—schaffnerite—concerning which I have been unable to find any further reference in mineralogical literature, is therein upheld, and the suggestion of Penfield's regarding the possible identity of tritochorite and

* This Journal, III, xxvi, 361, 1883.

† Monatsb. Berl. Acad., 1883, 1215.

‡ La Ramirita, nueva especie mineral, Mexico, 1885.

§ Tschermak's Min. and Petr. Mitth., iii, 506, 1880; iv, 97, 1881.

|| Chemische Natur der Mineralien, p. 32.

¶ Ann. d. Mines, IV, xiv, 150, 1848; Phil. Mag., III, xxxiv, 395, 1849.

cupro-descloizite is confirmed by Frenzel himself, who is quoted as writing to Professor DesCloizeaux that he had not thought it necessary to consider as an essential constituent the two per cent of water which he had found in tritochorite.

Laboratory of the U. S. Geological Survey,
Washington, D. C., Feb. 9, 1889.