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COLLOFORM HYDROTHERMAL MUSCOVITE ("CHACALTAITE")

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ABSTRACT

An analysis of a $2M_1$ polytype of fibrous colloform muscovite from a low temperature hydrothermal vein occurrence at Chacaltaya, Bolivia, gave: Na_2O 0.31, K_2O 10.14, Rb_2O 0.12, Cs_2O 0.01, CaO 0.04, BaO 0.05, Li_2O 0.12, MgO 1.06, FeO 2.46, MnO 0.06, Fe_2O_3 1.04, Al_2O_3 32.09, SiO_2 47.56, TiO_2 0.05, H_2O- 0.14, H_2O+ 3.86, F 1.37, O=F 0.58, total 99.90. Specific gravity 2.84; $d(005)$ 1.9975 Å: β 1.584, γ 1.590, $2V$ 45°. The material had earlier been described by Kolaczkowska (1936) as an independent species, here discredited.

The occurrence of muscovite in hydrothermal veins at Chacaltaya, near La Paz, Bolivia, in the unusual form of fibrous colloform crusts has been noted by Thugutt (1936, 1964) and by Ahlfeld and Reyes (1938). A specimen from the Ahlfeld collection is described here. It consists of pale yellowish gray crusts up to several cm thick composed of concentric layers (Fig. 1). The surface of the crusts is botryoidal with a smooth, almost polished appearance and a waxy luster. The individual layers are easily separable and range up to about 1 mm in thickness. They are composed of fibers or laths, visible under low magnification, that are arranged with their direction of elongation, [100], perpendicular to the surface of the layers. On cross-fractures the layers have a silky luster and are translucent. Optically the mineral has $\beta = b = 1.584 \pm .001$, $\gamma = a = 1.590 \pm .001$ and 2V $(-) \sim 45°$. The measured specific gravity is 2.84.

X-ray patterns taken in Cu radiation by both film and chart techniques, employing sample mounts so prepared as to minimize preferred orientation, gave excellent muscovite patterns of the $2M_1$ type. Interplanar spacings determined with the aid of Si as internal standard gave $d(005) = 1.9975$ Å $\pm .0010$ and $d(006) = 1.6634$ Å $\pm .005$ [lower precision because of poor line quality].

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[1] Mineralogical Contribution No. 471.

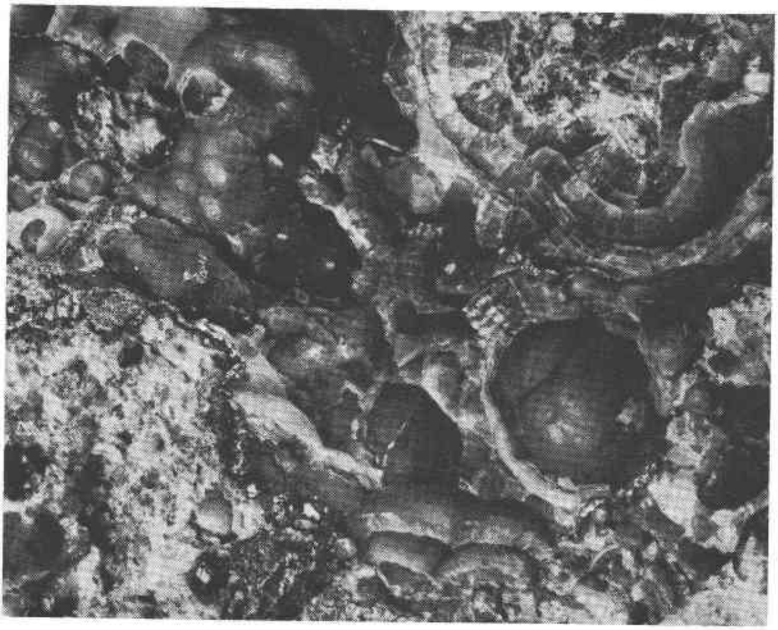

FIG. 1. Colloform crust of muscovite showing fibrous structure on cross fractures. Approximately natural size.

The chemical analysis (Table 1) was calculated to the half-cell total of 22 positive valences, with Si and sufficient Al assigned to bring the tetrahedral layer to a total of 4 atoms. The resulting formula conforms very closely to the requirements of muscovite, with the usual small deficiency in interlayer ions. The small excess charge on the tetrahedral layer (+0.20) is compensated by deficiencies in both the octahedral (−0.12) and interlayer positions (−0.08) on the basis of the cation assignments employed. The composition is of interest because of the large content of F, amongst the highest reported for muscovite, and the very small content of Na. The content of H_2O+ is exactly that needed to fill the (OH, F) position. The small amount of H_2O- present is not sufficient to fill the interlayer vacancies.

A less precise but comparable analysis of an identical mica from Chacaltaya has been reported by Thugutt (1936). The name chacaltaite was given by Kolaczkowska (1936) to this material on the basis of supposed differences in the X-ray powder pattern from that of muscovite. These differences are owing to preferred orientation, and the name chacaltaite should be discarded.

The present specimen shows the colloform muscovite coating a cavity in vein material containing siderite, quartz, pyrite and arsenopyrite. The Chacaltaya veins also carry wolframite, cassiterite, fluorite and tourma-

TABLE 1. ANALYSIS OF MUSCOVITE

		Atoms per half cell		
Na_2O	0.31	Na	0.040	
K_2O	10.14	K	0.868	
Rb_2O	0.12	Rb	0.005	0.917
Cs_2O	0.01	Cs	0.0003	
CaO	0.04	Ca	0.003	
BaO	0.05	Ba	0.001	
Li_2O	0.12	Li	0.032	
MgO	1.06	Mg	0.106	
FeO	2.46	Fe''	0.138	2.064
MnO	0.06	Mn''	0.003	
Fe_2O_3	1.04	Fe'''	0.052	
Al_2O_3	32.09	Al	1.733	
		Al	0.805	
SiO_2	47.56	Si	3.193	4
TiO_2	0.05	Ti	0.002	
H_2O-	0.14			
H_2O+	3.86	OH	1.728	2.019
F	1.37	F	0.291	
	100.48			
O=F	0.58			
Total:	99.90			

Analyst: Eileen H. Oslund. Spectrographic analysis by Jun Ito also gave Ti, Be, Sn, Sr, Cu, Ga, Ag in the range 0.00X–0.000X percent.

line. This hypothermal to upper mesothermal assemblage in other vein and greisen deposits often carries coarsely crystallized muscovite or lithian micas as gangue minerals. At Chacaltaya the muscovite is the last formed mineral, presumably from a gel at a relatively low temperatue. The temperature dependency of the mutual solubility in the muscovite-paragonite join is known experimentally down to 200°C and 30,000 psi, at which point approximately 0.2 weight percent Na_2O enters muscovite (Eugster and Yoder, 1955). This is less than the amount found here, but the method is not applicable because paragonite is not present as a coexisting phase. The present mica contrasts with the fine-grained micas found in soils, sediments, low grade schists and as alteration products in low temperature hydrothermal environments. These micas typically show a large deficit of interlayer alkali ions and a high water content, with 1-layer structures more common. The fibrous gümbelite described by Aruja (1944) as occurring in veinlets in slate is of the $2M_1$ type, however, and the stability of this polytype, recently discussed by Velde (1965), evidently extends to relatively low temperatures.

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A CONVENIENT NONOXIDIZING HEATING METHOD FOR METAMICT MINERALS[1]

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Abstract

Heating metamict minerals in a nonoxidizing atmosphere for X-ray study is facilitated by a technique using charcoal rather than the customary tube furnace.

Metamict minerals generally can be identified by X-ray diffraction after they are heated under certain time and temperature conditions necessary to produce crystallinity. Diagnostic patterns are commonly obtained by heating the sample for 1 hour at 1000°C in air, in which case the crystalline phases developed may include those promoted by an oxidizing atmosphere. This is the "standard" heating procedure suggested by Lima-de-Faria (1956). In some instances, however, it is desirable to heat the sample in a nonoxidizing atmosphere, and for this purpose investigators have generally used a tube furnace through which a stream of nitrogen or helium is passed (Bannister and Horne, 1950; Lima-de-Faria, 1964).

Inasmuch as setting up and operating the tube furnace may be quite inconvenient and time-consuming, we have tried a practical alternative

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