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PELLYITE: A NEW BARIUM SILICATE MINERAL FROM THE YUKON TERRITORY

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ABSTRACT

The new mineral pellyite was found in a contact metasomatic deposit in the Yukon Territory. The mineral is orthorhombic, *Cmcm*, $Cmc2_1$ or *C2cm*, with $a = 15.677(4)$, $b = 7.151(2)$, and $c = 14.209(6)$ Å. The ideal formula is $Ba_2Ca(Fe,Mg)_2Si_6O_{17}$, $Z = 4$, D (meas.) 3.51 gm/cm^3. X-ray powder diffraction data show the following strong lines: 3.43Å (100) (402); 3.19Å (65) (022); 2.308Å (60) (423); 3.46Å (55) (021) 3.83Å (50) (113); 2.117Å (50) (424).

INTRODUCTION

The discovery of this new mineral resulted from an investigation of the mineralogy of a contact metasomatic deposit in the Yukon Territory. The mineral deposit is located on the Sheldon Lake Sheet (G.S.C. Map 105J) near the headwaters of the Ross and Pelly Rivers and approximately two miles southwest of Gillespite Lake. The investigation was a partial requirement for a Master's degree by one of us (Montgomery 1960).

We have named the mineral pellyite because of its proximity to the headwaters of the Pelly River. The name has been approved by the Commission on New Minerals and Mineral Names, I.M.A. Type specimens of pellyite are in the mineral collection of the Department of Geology, The University of British Columbia.

Pellyite occurs in a contact metasomatic deposit adjacent to a porphyritic quartz monzonite stock. It occurs as a massive crystalline constituent of skarns which have developed in original limestone bodies adjacent to the igneous contact. The average grain size of the pellyite is approximately 2 mm. The mineral assemblage includes pellyite, barite, hedenbergite, quartz, andradite, taramellite, gillespite, sanbornite, chalcopyrite and witherite. Pellyite is also known to occur in Sec. 22, T. 11 S., R. 25E., Mount Diablo Base and Meridian, Fresno County, California, U.S.A. (Alfors 1966).

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* Deceased.

Physical Properties

In hand specimen, pellyite is massive, crystalline and intimately mixed with its associated minerals and alteration products. The mineral is colorless to pale yellow, has a hardness of 6 and fuses at 3 to a weakly magnetic bead. It possesses a vitreous luster and concoidal fracture. In thin section, the mineral is seen to possess a poorly developed prismatic cleavage. The mineral decomposes slowly in dilute hydrochloric acid leaving a white residue. The optical properties are given in Table 1.

Chemical Composition

A gravimetric analysis of pellyite was carried out by Sharples, Elridge and Company of Vancouver, B.C. The results appear in Table 3 along with the determined and idealized chemical formula. The trace elements were detected by an emission spectrographic analysis.

X-ray Study

Single crystal Weissenberg and precession photographs revealed systematic absences of the type : hkl, $h + k = 2n + 1$; and $h0l$, $l = 2n + 1$; which indicates the space group possibilities $Cmcm$, $Cmc2_1$ or $C2cm$. The unit cell data is listed in Table 1.

Table 1. Optical and Unit Cell Data

a	15.677(4) [1] Å
b	7.151(2)
c	14.209(6)
Space group	$Cmcm$, $Cmc2_1$ or $C2cm$
Density (measured)	3.51 gm/cm^3
Density (calculated)	3.48
Z	4
α	1.643
β	1.645 Na-light + 0.003
γ	1.649
$2V$ (estimated)	47°
Opt.	+
Dispersion	rhombic, very strong with $r > v$

[1] Number in parentheses refers to one standard deviation.

The x-ray power data (Table 2) was obtained from a Philips diffractometer using Ni-filtered Cu$K\alpha$ radiation, a scan speed of $\frac{1}{2}°$ 2θ/minute and a KBr internal standard. Unit cell parameters were determined from the powder diffraction data using the U.S.G.S. least squares refinement program (Evans, Appleman & Handwerker 1963). A crystal structure investigation is presently being undertaken by one of us (E.P.M.).

TABLE 2. PELLYITE : X-RAY POWDER DATA

Indexed on the basis of cell parameters presented in Table 1.
(Diffractometer scan with internal standard, Cu/Ni radiation, Cu$K\alpha$ = 1.5418Å, I_0 = visually estimated peak intensities.)

I_0	$d_{meas.}$	$d_{calc.}$	hkl	I_0	$d_{meas.}$	$d_{calc.}$	hkl
30	7.83	7.840	200	10	2.456	2.456	513
10	7.10	7.104	002			2.452	602
10	6.51	6.506	110	20	2.356	2.357	130
40	5.91	5.916	111			3.325	315
40	4.22	4.219	310	60	2.308	2.307	423
25	3.92	3.919	400	30	2.237	2.237	132
50	3.83	3.829	113			2.233	514
55	3.46	3.467	021	50	2.117	2.120	424
100	3.43	3.432	402	30	2.112	2.113	711
20	3.25	3.235	204	5	2.099	2.105	604
65	3.19	3.194	022	20	2.074	2.074	332
45	3.17	3.171	221	15	2.048	2.047	712
45	3.15	3.150	313			2.027	406
20	3.12	3.118	114	20	2.022	2.022	622
10	2.955	2.958	222			2.020	515
30	2.856	2.854	023	25	1.955	1.960	800
5	2.717	2.717	314	10	1.950	1.948	713
5	2.682	2.682	223	5	1.926	1.927	623
25	2.661	2.662	512	10	1.852	1.851	334
40	2.643	2.641	420	10	1.829	1.827	516
20	2.629	2.632	404	10	1.774	1.776	008
		2.613	600				
25	2.598	2.604	115				
		2.600	421				

TABLE 3. PELLYITE : CHEMICAL COMPOSITION

Oxide[1]	*Wt. %*
SiO_2	40.50
BaO	34.16
CaO	6.25
FeO	12.46
MnO	0.57
MgO	1.46
ZnO	1.05
Al_2O_3	3.53
Total	99.98

Chemical Formula (based on 68 oxygens) :

$$Ba_{7.53}\ Ca_{3.77}\ Mn_{0.27}\ Fe_{5.83}\ Mg_{1.23}\ Zn_{0.43}\ Al_{2.33}\ Si_{22.90}\ O_{68}$$

Idealized Formula :

$$4[Ba_2Ca(Fe,Mg)_2Si_6O_{17}]$$

[1] S, Sr, Na, B, Be, Ti and Zr reported in trace quantities.

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