Short Communications

A joaquinite-like mineral from Ohmi, Niigata Prefecture, Central Japan. By KAZUYA CHIHARA, MASAYUKI KOMATSU and TADATO MIZOTA, *Department of Geology and Mineralogy, Faculty of Science, Niigata University, Niigata 950-21.*

ABSTRACT

A joaquinite-like new mineral was found from Ohmi, Niigata Prefecture, Central Japan in 1971. Chemical analysis gave, in weight %, SiO_2 35.12, Nb_2O_5 1.42, TiO_2 12.48, Al_2O_3 0.27, REE_2O_3 1.12, FeO 4.75, CaO trace, SrO 5.85, BaO 31.31, ZrO 0.19, MgO 0.03, Na_2O 2.74, K_2O 0.94, MnO trace, $\text{H}_2\text{O} +$ 2.59, $\text{H}_2\text{O} -$ 0.47, total 99.36, corresponding to

The precession photographs show this mineral to be orthorhombic with a $9.777 \pm 0.005 \text{ \AA}$, b $10.517 \pm 0.006 \text{ \AA}$, c $22.392 \pm 0.12 \text{ \AA}$, and possible space group $Pcam$ or $Pca2_1$. Optically biaxial with $(+)2V = 42 - 48^\circ$, $\alpha = 1.707 \pm 0.003$, $\gamma = 1.778 \pm 0.003$, and weakly pleochroic with axial colours $X = Y =$ colorless and $Z =$ light yellow. The hardness is 5.5 (Mohs); cleavage (001) perfect; density = 3.62 (measured), $3.87 \text{ g} \cdot \text{cm}^{-3}$ (calculated).

In autumn of 1971, an unusual yellow mineral associated with benitoite, leucosphenite and other minerals was found in an amphibole-quartz-albite dike cutting serpentinite in Ohmi, Niigata Prefecture, Central Japan.

They occur as a spotted aggregate (up to 1 cm in diameter) or lense (up to 3 cm in length) consisting of anhedral angular crystals less than 2 mm in length.

Although its X-ray powder data are very close to those for joaquinite (Table 1), it is compositionally different from those of Californian and Ilimaussaq materials re-examined and studied by

Table 1. X-ray powder data for a joaquinite-like mineral and joaquinite.

Ohmi, Japan				Greenland*			
<i>d</i> obs. Å	<i>d</i> calc. Å	<i>I</i>	<i>h k l</i>	<i>d</i> obs. Å	<i>I</i>	<i>h k l</i>	
11.13	11.20	20	0 0 2	7.09	0.9		
6.80	6.82	5	1 1 1	6.81	1.0		
5.60	5.60	30	0 0 4	5.58	67.5		
5.12	5.12	3	2 0 1				
4.86	4.89	3	0 2 0	4.82	2.0		
4.75	4.76	3	2 0 2				
4.47	4.48	33	0 2 2	4.44	4.2		
4.29	4.30	15	2 0 3	4.30	1.5		
				3.79	2.5		
3.682	3.682	9	0 2 4	3.72	3.5		
				3.66	1.0		
3.302	3.300	15	3 1 0	3.55	1.2		
3.235	3.228	16	2 2 3	3.30	3.5		
3.125	3.113	6	1 3 0				
3.099	3.083	10	1 3 1	3.05	4.2		
3.076	3.043	10	2 0 6				
3.007	3.016	18	2 2 4	3.00	8.8		
2.966	3.966	36	0 2 6	2.95	17.0		
2.919	2.921	14	1 1 7	2.91	10.5		
2.799	2.799	100	0 0 8	2.80	100.0		
2.611	2.611	41	4 0 1	2.613	3.5		
2.469	2.471	7	2 0 8	2.467	2.0		
2.441	2.444	32	0 4 0	2.418	5.8		
2.434		24					
2.429	2.429	21	0 2 8	2.375	0.9		
2.382	2.387	7	3 3 0	2.267	2.2		
2.267	2.267	19	4 0 5	2.232	7.5		
2.239	2.240	31	0 0,10				
			0 4 4	2.217	4.5		
2.209	2.212	5	4 2 3	2.155	1.0		
				2.133	1.2		
2.138	2.135	3	3 1 8	2.054	1.2		
2.052	2.056	7	5 1 0	2.028	2.0		
2.037	2.031	9	1 3 8	1.956	3.1		
				1.895	2.8		
1.901	1.898	10	2 2,10	1.872	3.5		
1.879		9					
1.872	1.869	11	1 1 5	1.807	2.2		
1.808	1.807	3	4 0 9	1.775	1.0		
1.789	1.785	5	4 4 1				
1.779		5		1.738	2.8		
1.745		3					
1.732		3		1.672	3.0		
1.691		3					
1.678		3		1.647	1.9		
1.657		5		1.634	1.9		
1.652		2					
1.645		3					
1.601		19					

* Semenov *et al.* (1967)

Semenov *et al.* (1967) respectively, due to its very low rare earth and higher barium and strontium contents (Table 2). Chemical analysis gave the formula as follow:

* RE wt.=100. ** $\text{Ta}_2\text{O}_5=0$.

Table 2. Chemical compositions of a joaquinite-like mineral and joaquinite.

	Ohmi	San Benito joaquinite*
	Wt. %	Wt. %
SiO ₂	35.12	35.17
Nb ₂ O ₅	1.42	n. d.
TiO ₂	12.48	12.24
Al ₂ O ₃	0.27	n. d.
REE ₂ O ₃	1.12	17.74
FeO	4.75	3.76
CaO	tr.	0.32
SrO	5.85	3.84
BaO	31.31	22.36
ZrO	0.19	n. d.
MgO	0.03	0.09
Na ₂ O	2.74	1.75
K ₂ O	0.94	0.04
MnO	tr.	0.08
H ₂ O+	2.59	n. d.
H ₂ O-	0.47	n. d.
Total	99.36	98.23

* By EPMA. Laird and Albee (1972).

The hardness is 5.5(Mohs); cleavage (001) perfect; density=3.62 (measured), and 3.87 g·cm⁻³ (calculated).

The precession photographs using a single crystal about 0.1 mm in length show this mineral to be orthorhombic with $a=9.777 \pm 0.005 \text{ \AA}$, $b=10.517 \pm 0.006 \text{ \AA}$, $c=22.392 \pm 0.012 \text{ \AA}$, and possible space group *Pcam* or *Pca*2₁, which is distinct from those of Californian material studied by Cannillo *et al.* (1972) and Ilimaussaqa material studied by Semenov *et al.* (1967). The present mineral shows diffraction spectra violating the space group requirement of known joaquinites, and either diffuse reflections reported by Cannillo *et al.* (1972) nor *C* or *A*-centered lattice spectra, although the reflections with $h+k=2n+1$

appear exclusively on the reciprocal lattice plane with $l=2n$ (Fig. 1).

Under the microscope, it is optically biaxial with (+)2V=42–48°, $\alpha=1.707+0.003$, $\gamma=1.778+0.003$, $\gamma-\alpha=0.071+0.003$, and weakly pleo-

Fig. 1. (a) Precession photographs of joaquinite-like mineral from Ohmi. $\text{CuK}\alpha$ radiation. Weak reflections of $h+k \neq 2n$ are seen on the reciprocal lattice planes of $hk0$ and $hk2$.

(b) Weighted reciprocal lattice nets reproduced from the Precession photographs in (a).

chroic with axial colours, $X=Y=\text{colorless}$ and $Z=\text{light yellow}$.

From the above mentioned natures distinct from those of hitherto known joaquinite and its monoclinic derivative, the present mineral is a new species. Detailed studies on crystal structure are now under way.

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REFERENCES

- CANNILLO, E., MAZZI, F. and ROSSI, G. (1972) *Tschermaks Min. Petr. Mitt.*, 17, 233-246.
- LAIRD, J. and ALBEE, A. L. (1967) *Amer. Miner.*, 57, 85-102.
- PALACHE, C. and FOSHAG, W. F. (1932) *Amer. Miner.*, 17, 308-312.
- SEMENOV, E. I., BUKIN, V. I., BALASHOV, YU. A. and SORENSSEN, H. (1967) *Amer. Miner.*, 52, 1762-1769.

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