

readily seen that thorogummite, $\text{Th}(\text{SiO}_4)_{1-x}(\text{OH})_{4x}$, and kasolite, $\text{Pb}(\text{UO}_2)(\text{SiO}_3)(\text{OH})_2$, can account for the stated composition. The proportions of the two minerals in the mixture cannot be ascertained from the analysis because it is not known how much of the PbO is present in kasolite and how much is present in the thorogummite from radioactive disintegration of uranium and thorium. The optical and x -ray study suggests that the two minerals are present in approximately equal amounts.

The writer gratefully acknowledges the many helpful criticisms of Professor Clifford Frondel in the course of the present investigation.

REFERENCES

- FRONDEL, CLIFFORD (1953), Hydroxyl substitution in thorite and zircon: *Am. Mineral.*, **38**, 1007-1018.
 — (1956), Mineralogy of thorium: *U. S. Geol. Survey Prof. Paper*, **300**, 567-579.
 SIMPSON, E. S. (1910), Pilbarite, a new mineral from the Pilbara goldfields, W. A.: *Chem. News*, **102**, 283-284.
 — (1928), Famous mineral localities: Wodgina, North West Australia: *Am. Mineral.*, **13**, 457-458.
 — (1930), Contributions to the mineralogy of Western Australia: *Royal Soc. Western Australia Jour.*, **16**, 33-35.
 — (1952), *Minerals of Western Australia*, Perth, Vol. **3**, 139-142.

THE AMERICAN MINERALOGIST, VOL. 42, NOVEMBER-DECEMBER 1957

UNIT CELL AND SPACE GROUP OF LARSENITE, PbZnSiO_4

FREDERIC G. LAYMAN, *Harvard University, Cambridge, Massachusetts.*

Larsenite from Franklin, New Jersey was described in 1928 by Palache, Bauer, and Berman, and a summary description was given by Palache in 1935. On morphological and chemical data, the mineral was placed in the Olivine Group and has been so accepted by later writers. No single-crystal or powder x -ray diffraction work has been reported thus far. Recently, samples of larsenite were supplied by the Harvard Mineralogical Museum to Dr. Heinrich Neumann of the University of Oslo, who drew our attention to the fact that powder photographs of the mineral are not of the general olivine type.

An x -ray single-crystal study of type larsenite from Franklin has been made by the rotation, Weissenberg, and precession methods using Cu and Mo radiation. This work has shown that larsenite is not isostructural with the Olivine Group, but is related dimensionally thereto. The a and b axes of larsenite are approximately double those of olivine and the c

axes of the two minerals are approximately the same. Both minerals are orthorhombic, but the space groups are different. A summary of the x-ray data follows:

$$a_0 = 8.23 \pm .01 \text{ \AA} \quad a_0:b_0:c_0 = .435:1:.267$$

$$b_0 = 18.94 \pm .01 \text{ \AA} \quad \text{Space group: } Pnam \text{ or } Pna$$

$$c_0 = 5.06 \pm .01 \text{ \AA} \quad \text{Unit cell contents } 8 [\text{PbZnSiO}_4]$$

The cell dimensions were obtained from Weissenberg O-layer photographs. Closely conformable values were obtained from the rotation and precession photographs. The powder photograph data in Cu radiation for larsenite are given in part in Table 1.

As no doubly terminated crystals of larsenite have been found, it is uncertain whether the mineral belongs in the orthorhombic *mmm* class (space group *Pnam*) or in the orthorhombic *mm* class (space group *Pna*). The orientation of the structure cell is identical with that of the morphological cell originally described, but the *a* and *b* axes are doubled with respect to the morphological unit.

The aid of Dr. Clifford Frondel is gratefully acknowledged.

TABLE 1

Line No.	Intensity	<i>d</i> meas.	1/ <i>d</i> ² meas.	1/ <i>d</i> ² calc.	<i>hkl</i>
1	2	7.47	.0179	.0176	110
2	1	6.23	.0258	.0260	120
3	7	4.87	.0423	.0419	011
4	2	4.71	.0451	.0448	040
5	5	4.20	.0568	.0567	111
6	4	4.00	.0625	.0620	210
7	1	3.90	.0659	.0651	121
8	2	3.78	.0701	.0704	220
9	1	3.55	.0795	.0791	131
10	2	3.44	.0846	{ .0844	230
				{ .0848	150
11	10	3.19	.0984	{ .0983	201
				{ .0987	141
12	9	3.03	.1090	{ .1091	051
				{ .1095	221
13	1	2.95	.1150	.1156	160
14	9	2.85	.1230	{ .1239	151
				{ .1235	231
15	5	2.79	.1285	.1292	250
16	5	2.72	.1350	.1360	310
17	1	2.65	.1425	.1431	241

BIBLIOGRAPHY

1. PALACHE, CHARLES, BAUER, L. H., AND BERMAN, HARRY (1928), Larsensite, Calcium Larsenite, and the associated Minerals at Franklin, N. J. *Am. Mineral.*, **13**, 334-340.
2. PALACHE, CHARLES (1935), The Minerals of Franklin and Sterling Hill, Sussex County, New Jersey, *U.S.G.S. Professional Paper*, **180**, 80-81.

THE AMERICAN MINERALOGIST, VOL. 42, NOVEMBER-DECEMBER 1957

NOTES ON A PERALKALINE GRANITE FROM CASHES LEDGE,
GULF OF MAINE

PRIESTLEY TOULMIN III, *Harvard University, Cambridge 38, Massachusetts.*

The writer has recently had the opportunity to examine a specimen of granite from Cashes Ledge, a submarine prominence in the Gulf of Maine. The specimen was collected by Dr. John M. Zeigler of Woods Hole Oceanographic Institution. Although the precise location of the specimen is not available, reference to topographic maps of the area (Murray, 1947, Fig. 7) indicates that the position must be approximately 42° 54' N. Lat., 68° 56' W. Long.

The hand specimen is a roughly rectangular slab approximately 5×4×1 cm. Bryozoans and algae encrust one of its larger sides; the side opposite is freshly broken. Megascopically one can recognize quartz, alkali feldspar, black amphibole, and a little dark green pyroxene, all having an average grain size of about three millimeters. Under the hand lens, tiny crystals of iron-rich olivine may be discerned. The minerals appear quite fresh; the only sign of weathering is an occasional speck of limonite in the amphibole.

Under the microscope, the rock is seen to be holocrystalline, hypauto-morphic granular. Quartz occurs in anhedral grains averaging 1-3 mm. in diameter, ranging up to 5 mm. The quartz shows very slightly wavy and irregular extinction, and carries many tiny clear inclusions. Microperthite subhedra have about the same size range as the quartz, and are composed of elongate and more or less equant irregular areas of albite in an untwinned microcline host. Apparent differences of shape between albite masses probably reflect different orientations of host crystals relative to the plane of the thin section. Plagioclase is concentrated slightly at the margins of perthite grains, but no independent extra-perthitic plagioclase crystals were seen. Tiny specks of clay minerals disseminated through the microcline give it a "dusty" appearance in thin section. A specimen of microperthite was homogenized by heating at 910° C. ± 10° C. for about fifty hours; an x-ray powder pattern was