ported values, are: $\alpha=1.752$, $\beta=1.782$, $\gamma=1.815$ (all ± 0.002), 2V large. Pleochroism: $X=b$, very pale blue; $Y=a$, pale blue; $Z=c$, deep blue. Space group $Pcab$: $a=9.876\pm0.001$ Å, $b=19.812\pm0.003$ Å; $c=5.381\pm0.001$ Å; $Z=4$; cell volume 1052.86 Å^3; $D_o=4.138$ g cm^{-3}, $D_m=4.11$ g cm^{-3}.

The formula 4 $[Cu_5(SiO_3)_4(OH)_2]$, which differs from those formerly proposed, fulfills the requirement of the space group symmetry that atoms in the structure be present in multiples of 4, contains only hydroxyl groups, and gives close agreement between measured and calculated specific gravity. Application of the Gladstone-Dale relation to this formula, using the specific refractive energy value of $k_{CuO}=0.173$ (Am. Mineral. **50**, 288, 1963) and the calculated specific gravity 4.138, gives a mean calculated n of 1.786, in excellent agreement with the mean measured n of 1.783.

THE STRUCTURE OF TSUMEBITE[1]

M. C. Nichols, *University of California, Lawrence Radiation Laboratory, Livermore, California.*

Three dimensional single crystal data has been used to determine the crystal structure of tsumebite. The crystal used was from the Morenci, Arizona locality. Due to the extreme tendency of tsumebite to occur as intimately intergrown crystals, considerable difficulty was encountered in obtaining a suitable, single crystal.

The unit cell is monoclinic with $a=8.70$, $b=5.80$, $c=7.85$ Å, $\beta=111.5°$ and two formula units per unit cell. The space group is $P2_1/m$. Lead and copper coordinates were determined from a Patterson synthesis. The remaining atoms were found using least-square and Fourier methods. The structure determination has indicated that the previous formula $(Pb_2Cu(PO_4)(OH)_3\cdot 3H_2O)$ is incorrect. Subsequent fluorescence analysis has shown that the formula is most likely $Pb_2Cu(PO_4)(SO_4)OH$.

THE CRYSTAL STRUCTURE OF MIZZONITE, A CALCIUM AND CARBONATE RICH SCAPOLITE

J. J. Papike and Neville Stephenson, *U. S. Geological Survey, Washington, D. C., and School of Chemistry, University of New South Wales, Kensington, Australia.*

The crystal structure of a 70.1% meionite scapolite from Grenville, Quebec, with $a=12.169\pm.004$, $c=7.569\pm.003$ Å, and space group $I4/m$ has been refined using three-dimensional x-ray intensities collected by integrated Weissenberg film techniques. Starting with positional parameters from a refined marialite scapolite structure (Papike and Zoltai, 1965, *Am. Mineral.* **50**, 290) the model was completed by Fourier methods and refined by least squares. The refined structure is basically the same as that of marialite with the interesting differences concerning the aluminum distribution in the tetrahedral framework and the crystal chemical role of carbonate.

	x	y	z
(Ca,Na,K)	.1428± .0003	.2170± .0003	0
(Si,Al)-1	.3391± .0003	.4084± .0003	0
(Si,Al)-2	.3393± .0002	.0866± .0002	.2069± .0004
O-1	.4581± .0007	.3480± .0007	0
O-2	.3120± .0008	.1280± .0008	0
O-3	.0510± .0005	.3489± .0005	.2081± .0010
O-4	.2332± .0005	.1354± .0005	.3263± .0011
(C,S)	0	0	0

[1] Work performed under the auspices of the U. S. Atomic Energy Commission.