cooling histories of the pyrrhotites, because slow cooling would tend to favor the formation of monoclinic pyrrhotite, particularly for pyrrhotites with compositions near the upper limit for iron. For lesser amounts of iron it would probably appear as a distinct phase regardless of cooling history. It is hoped to verify this relationship by heating and slow cooling of natural pyrrhotites across the transformation boundary between the hexagonal and monoclinic phase.

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THE AMERICAN MINERALOGIST, VOL. 48, JULY-AUGUST, 1963

THE UNIT CELL AND SPACE GROUP OF STEWARTITE[1]

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Tennyson (1956) reported that stewartite, $MnFe_2(OH)_2(PO_4)_2 \cdot 8H_2O$, is monoclinic with the unit cell parameters listed in Table 1. The value of the magnitude of b(60.8 Å) is exceptionally large by comparison with parameters of reduced unit cells of most inorganic substances. Accordingly, the unit cell has been reinvestigated.

Crystals of stewartite from the Palermo and Fletcher quarries, N. Groton, N. H., were used in this investigation. The stewartite from the Palermo quarry occurs as radiating groups of small yellow crystals associated with strunzite, laueite, eosphorite, "diadochite," rockbridgeite, and siderite, while that from the Fletcher quarry occurs as aggregates of yellow crystals in cavities in rockbridgeite with hureaulite, strengite and metastrengite. In both cases the minerals are alteration products of triphylite. The identity of the stewartite was confirmed with powder photographs, the patterns corresponding closely to those described by Murdoch (1958) and Neves (1958, 1960).

The crystals from the Palermo quarry resemble those described by Tennyson from Hagendorf, and are bounded by three pinacoids. Rota-

[1] Contribution No. 251 The Mineralogical Laboratory, Department of Geology and Mineralogy, The University of Michigan.

TABLE 1. UNIT CELL DATA FOR STEWARTITE AND LAUEITE

	Stewartite Tennyson (1956)	Stewartite this work	Stewartite this work	Laueite Strunz (1954)
a	7.17 Å	2×5.23 Å	7.25 Å	5.28 Å
b	60.8	10.77	60.9	10.66
c	10.41	7.25	2×5.23	7.14
α	90°	90°35′	90°52′	107°55′
β	109°32′	109°58′	109°58′	110°59′
γ	90°	71°21′	88°01′	71°07′
Symmetry or space group	monoclinic	$P\bar{1}$ or $P1$	$\bar{1}$ or 1	$P\bar{1}$ or $P1$
Z	12	2	12	1

tion and Weissenberg photographs obtained with each of three principal zone axes as rotation axes showed that stewartite is triclinic with space group $P\bar{1}$ or $P1$. Unit cell parameters are tabulated in Table 1. There is an obvious correspondence of the magnitudes of a, c and β to the elements c, a and β, respectively, of the unit cell determined by Tennyson. A six-fold primitive unit cell with pseudomonoclinic geometry may be chosen such that

$$\vec{a}' = \vec{c}$$
$$\vec{b}' = -\vec{2a} + \vec{6b} - \vec{c}$$
$$\vec{c}' = \vec{a}.$$

The dimensions of this cell are listed in the third column of Table 1. There is a close relationship between this cell and that determined by Tennyson.

The unit cell of stewartite is closely related to that of the polymorph laueite. The parameters of the laueite unit cell were determined by Strunz (1954) and are given in Table 1. Rotation photographs of stewartite with the a axis as rotation axis show that there is a substructure with period $a/2$. The parameters of the subcell correspond closely to those of laueite with the exception of the value of the angle α.

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