SHORTER COMMUNICATIONS

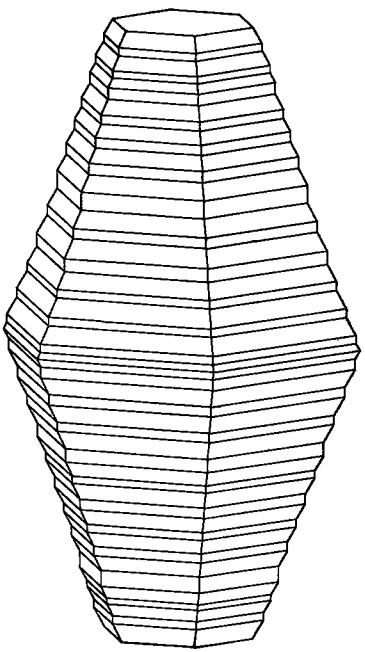
PYRRHOTITE CRYSTALS FROM THE STANLEIGH MINE, ELLIOT LAKE, ONTARIO

J. A. MANDARINO
Earth Sciences Division, Royal Ontario Museum, Toronto

R. S. MITCHELL
Dept. of Geology, University of Virginia, Charlottesville, Virginia

Early in 1958, the writers received some pyrrhotite crystals from the Stanleigh Mine at Elliot Lake, Ontario. Good euhedral crystals of pyrrhotite seemed sufficiently uncommon to deserve some study. The particular crystals studied are non-magnetic, but some of the crystals from the locality are magnetic.

The crystals range from two millimeters to about twenty millimeters in length. Although they do not give very good reflections on the two-circle goniometer, sufficient data were obtained to identify their three



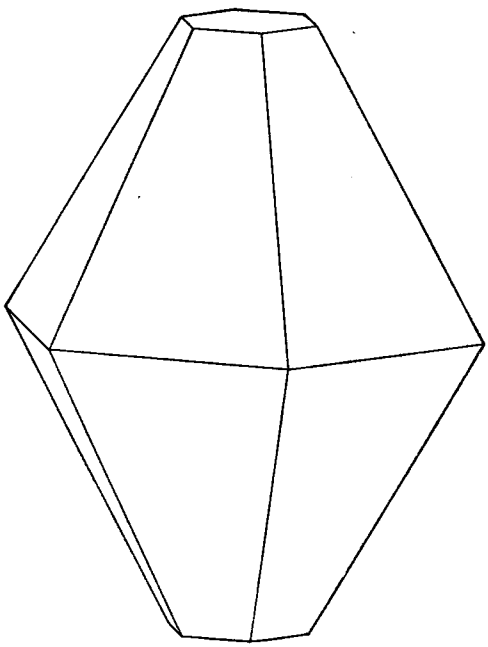


FIG. 1. Typical habit of the Stanleigh Mine pyrrhotite showing {00·1}, {10·0}, and {10·1}.

FIG. 2. Idealized crystal of pyrrhotite showing only {00·1} and {10·1}.

main forms: {00·1}, {10·0} and {10·1}. Other forms are present but they give very weak, diffuse signals.

The crystals occur in several different habits; the most common is shown in Figure 1. The crystal represented there is a combination of the three forms mentioned previously. The alternation of {10·0} and {10·1} produces the steep, tapering shape. For comparison, an idealized crystal consisting only of {00·1} and {10·1} is shown in Figure 2. No crystals of this latter habit have been seen. Flat plates, tabular parallel to {00·1}, are present but are less common than the dipyramidal type.

Most of the crystals exhibit fresh, sharp faces; some are tarnished and corroded. A few of the corroded crystals are skeletal in appearance. This is particularly true of the larger crystals.

Results of chemical and spectrographic analyses appear in Table 1.

The specific gravity was measured by two methods. Single crystals weighing a total of 0.917g. were measured first with a pycnometer. The specific gravity of the lot was 4.63. Specific gravities of individual crystals from this same group were then measured with a Berman balance. Specific gravity values ranged from 4.61 to 4.69 with a mean of 4.64 and a standard deviation of 0.03. Berry & Mason (1959) show a diagram relating the specific gravity of pyrrhotite to its atomic percentage of sulphur. According to their diagram, a pyrrhotite sample with a specific gravity of 4.64 contains about 52 atomic per cent of sulphur. The atomic per cent of sulphur in the Stanleigh Mine pyrrhotite, calculated from the chemical analysis given in Table 1, is 51.8. The chemical formula for the pyrrhotite studied is $Fe_{0.93}S$.

The values given in Table 2 represent average d values from four powder films taken with two cameras of 11.46 cm. diameter each. Both Fe$K\alpha$ and Cu$K\alpha$ radiation was used. The lines were indexed by means of the Davey chart (1922). Cell constants are as follows: $a = 3.44 \pm .01$ Å, $c = 5.75 \pm .01$ Å; $c:a = 1.672:1$. On one powder film, lines with d values of 2.29 and 1.37 were also noted. Perhaps these are due to impurities. However, if the $c:a$ ratio is doubled, these two lines can be

TABLE 1. PYRRHOTITE: CHEMICAL AND SPECTROGRAPHIC ANALYSES.

Chemical Analysis		Qualitative Spectrographic Analysis	
Fe	60.52	Fe:high	Zn:trace (0.01%)
S	37.20	Ni:trace-low (0.1%)	Mo:trace (0.001%)
		Co:trace (0.02%)	Ag:trace (<0.001%)
Total	97.72	Cu:trace (0.01%)	Ti:trace (0.01%)
Analyst: D. H. Rose		Si:trace-low (0.1%)	V:trace (0.01%)
		Pb:trace (0.005%)	Mn:trace (<0.001%)
		(Values in brackets are visual estimates given to show approximate concentrations) Analyst: Ontario Department of Mines #C7703.	

indexed for this larger unit cell as 00·5 and 11·5, respectively. Superstructures have been reported for pyrrhotite by Hägg & Sucksdorff (1933), Buerger (1947) and Graham (1949). Other investigators have obtained d values of 2.26 (A.S.T.M. cards #2-1241 and #3-1028) which cannot be indexed using the generally accepted $c:a$ ratio. Perhaps these are due to a similar impurity compound or superstructure.

Zero-level Weisenberg films (rotation about a-axis) showed no evidence of a superstructure for eight different crystals.

TABLE 2. X-RAY POWDER DATA FOR STANLEIGH MINE PYRRHOTITE.

$hk \cdot l$	$d_{obs.}$	$I_{obs.}$	$hk \cdot l$	$d_{obs.}$	$I_{obs.}$
10·0	2.99	s	00·4, 20·1	1.44	vw
00·2	2.87	vvw	20·2	1.32	w
10·1	2.65	vs	10·4	1.29	w
10·2	2.07	vvs	20·3	1.18	w
11·0	1.73	s+	12·1, 11·4	1.10	m
11·1	1.64	w	10·5	1.07	vw
10·3	1.61	w	12.2	1.05	m
20·0	1.49	vvw	30·0	0.99	mw

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