NOTES AND NEWS

AN OCCURRENCE OF MOLYBDENIAN STOLZITE IN ARIZONA*

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Stolzite containing about 9 per cent MoO_3 occurs near Miami, Gila County, Arizona. This tungsten-bearing mineral, which is considered to be an intermediate member of the isomorphous wulfenite-stolzite series, was noted by Faick and J. A. MacKallor,† in a prospect that was examined on behalf of the Defense Minerals Exploration Administration in November 1951. This prospect is situated low on the east slope of Day Peaks in the Lost Gulch area of the Inspiration quadrangle, and is about $1\frac{3}{4}$ miles southwest of the Copper Cities open-pit mine. The locality is in the Globe-Miami district, the geology of which has been described by Ransome (1903, 1904, 1919) and Peterson (1954).

The prospect in which the molybdenian stolzite was found consists of an adit about 100 feet long in a mineralized zone along a nearly vertical, easterly trending fault that cuts diabasic rocks. The principal constituents in the zone are altered host rock, limonite, and minor amounts of quartz. Scheelite, which was identified by its pale-bluish fluorescence under an ultraviolet light, was observed in the altered zone as a few isolated grains and as a single small pod about one inch wide and 4 inches long. The molybdenian stolzite occurs in cavities in quartz and disseminated in limonite. The thin, tabular, imperfectly formed white, lemon-yellow and orange crystals of the stolzite are megascopically indistinguishable from wulfenite.

From specimens collected by Faick, L. G. Evans‡ prepared a heavy-liquid concentrate of mineral grains using acetylene tetrabromide, and further purified the concentrate by handpicking out impurities with the aid of a microscope. Evans identified the mineral by its specific gravity (7.5), optically negative character, high indices of refraction like other members of the series, and by visual arc spectroscopic tests for W, Mo, and Pb. Examination of grains in thin section indicated that the mineral is altered along fracture planes to an unidentified isotropic material. Chemical analyses of the concentrate are given in Table 1.

Material submitted to the U. S. Geological Survey laboratories for x-ray confirmation of the molybdenian stolzite was found to contain minute amounts of an unidentified mineral and some brownish and

* Publication authorized by the Director, U. S. Geological Survey.

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TABLE 1. CHEMICAL ANALYSES OF MOLYBDENIAN STOLZITE FROM THE LOST GULCH LOCALITY, MIAMI, ARIZONA

Analyses by F. G. Hawley*

	(1)	(2)
PbO	56.27	56.3
WO_3	25.40	23.9
MoO_3	8.62	9.3
As_2O_5	4.56	4.2
P_2O_5	2.14	0.73
CaO	0.80	0.8
Fe_2O_3	0.28	—
SiO_2	—	0.4
R_2O_3	—	1.4
Total	98.07	97.03
Ratio W:Mo	3.5:1	3.06:1

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greenish-brown grains that were proved by *x*-ray powder diffraction to belong to the mimetite-pyromorphite group of minerals. The presence of these minerals probably accounts for the high content of As_2O_5 and P_2O_5 in the analyses, and also for the high content of PbO, which is in excess of that needed to satisfy the formulas of intermediate members of the wulfenite-stolzite series. Apparently the material used in the chemical analyses contained admixtures of these associated minerals although reasonable precautions were taken to obtain a pure sample.

In order to compare the mineral from Arizona with other wulfenites and stolzites, Hildebrand used *x*-ray patterns of wulfenite from Copiapo, Chile, and from Inyo County, California, and prepared *x*-ray patterns of stolzite from Broken Hill, New South Wales, Australia; tungstenian wulfenite (chillagite) from the Chillagoe and Christmas Gift mines, Chillagoe, Queensland, Australia, and wulfenite from Cairo, Egypt. A few analyses of the minerals from these localities have been published, but there is no assurance that the minerals acquired for *x*-ray exactly represent those used for the original analyses. A recent spectrographic examination of the wulfenite-stolzite group mineral from Cairo, Egypt by Janet Fletcher§ shows that it contains major amounts of lead and molybdenum and no detectable tungsten. Hence, it is a true wulfenite

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representing an end member of the wulfenite-stolzite series. It is noteworthy that *x*-ray examinations revealed that the two samples from Chillagoe, Queensland, Australia are dissimilar and neither of them corresponds to the tungstenian wulfenite reported by Palache and others (1951, pp. 1083–1085).

Comparison of the *x*-ray powder patterns of the minerals studied permits them to be grouped as follows:

Stolzite from Broken Hill (film 11468) and the mineral referred to as chillagite from the Chillagoe mine (film 11469) were found to be nearly identical and were accepted as standard patterns representing stolzite.

Wulfenites from Copiapo, Chile (film 5695), Inyo County, California (film 6544), Cairo, Egypt (film 11482) and the tungstenian wulfenite (chillagite) from the Christmas Gift mine (film 11483) were found to be nearly identical with each other but appreciably different from the two stolzites cited above, and were, therefore, accepted as standard patterns representing wulfenite.

The molybdenian stolzite from Arizona (films 11428, 11429, 11480 and 11481) gives an *x*-ray pattern that is intermediate between the stolzites and wulfenites cited above and it should probably be placed toward the stolzite end of the series.

Tungstenian wulfenite (chillagite) from Santa Rosa, province of San Luis, Argentina, is described by Ahlfeld and Angelelli (1948, pp. 204–205) and two analyses are given. These analyses and analyses of the tungstenian wulfenites from Chillagoe, Australia are reproduced in Table 2 for comparison with the analyses of the molybdenian stolzite from Arizona as given in Table 1.

Table 2. Chemical Analyses of Tungstenian Wulfenites

	Christmas Gift Mine Chillagoe, Australia	Santa Rosa, Province of San Luis, Argentina	
	1	2	3
PbO	53.9 to 54.7	47.80	49.50
WO_3	21.1 to 29.5	19.60	18.40
MoO_3	16.3 to 22.2	19.30	20.40

1—Analyses from Palache and others (1951, p. 1085).
2 & 3—Analyses from Ahlfeld and Angelelli (1948, p. 205).

According to Palache and others (1951, pp. 1083, 1087–1088), at least a partial isostructural series exists between wulfenite ($PbMoO_4$) and stolzite ($PbWO_4$) and W may substitute for Mo in intermediate members of the series; those authors state, however, that the few reported analyses

of stolzite do not reveal the substitution of Mo for W. As shown by chemical analyses the mineral collected at the Lost Gulch locality in Arizona probably is an example in which Mo takes the place of some of the W in the stolzite formula. The mineral is properly termed molybdenian stolzite because the ratio of W : Mo exceeds 1 : 1.

Insofar as the writers know, intermediate members of the wulfenite-stolzite series have been identified only from the above mentioned areas in Australia and Argentina. The scarcity of reported occurrences of intermediate members of this isostructural series is surprising inasmuch as neither wulfenite nor stolzite is very rare. The intermediate members of the series probably have been overlooked because of their similarity in appearance to wulfenite.

The writers gratefully acknowledge the assistance of L. G. Evans, F. G. Hawley and others whose efforts have made this report possible.

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THE AMERICAN MINERALOGIST, VOL. 43, JANUARY–FEBRUARY 1958

HUNTITE FROM TEA TREE GULLY, SOUTH AUSTRALIA

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Huntite, $Mg_3Ca(CO_3)_4$, occurs as a weathering product in the Proterozoic, Torrens Dolomite, near Tea Tree Gully, South Australia.

The Torrens Dolomite is fine-grained and compact, with minor interbedded shale and quartzite bands. Folding, minor faulting and jointing are present throughout the horizon. Around fold noses the shales and quartzites are often brecciated, though the dolomite itself is unbroken. Minor faults and a brecciated shale band are well-exposed to a depth of 50 feet in two small quarries in the Torrens Dolomite, 1 mile east of Tea Tree Gully.

Huntite occurs as sporadic nodules in the fault zones and in the