

Chavesite discredited

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ABSTRACT

The mineral described as chavesite by Murdoch (1958) is identical to monetite. Chavesite is discredited as a distinct mineral species.

DISCUSSION

The new mineral chavesite was described in 1958 by Joseph Murdoch in a paper reporting on the phosphate minerals of the Boqueirão pegmatite near the town of Parelhas, Rio Grande do Norte, Brazil. The description in its entirety is as follows (Murdoch, 1958, p. 1154):

One specimen of lithiophilite shows, on fracture surfaces with huréaulite and tavorite, an intermittent thin colorless crystalline coating which sometimes shows poorly formed individual crystals. This appears to be a new mineral, tentatively named “chavesite” (pronounced shav-*ez*-ite), after Dr. Onofre Chaves, an engineer of the Brazilian Departamento Nacional da Produção Mineral. It is a hydrated calcium manganese phosphate, but not enough material is available for a chemical analysis. Hardness is near 3, cleavages, two good, in the prism zone, and nearly perpendicular to each other. Optically, biaxial positive, with $2V$ large, and indices α 1.60, β 1.62, γ 1.65. Multiple twinning, with twin plane parallel to elongation of crystals. Extinction about 30° to the twin plane. A cleavage sliver which proved to be a single individual was used to determine the symmetry and cell dimensions. Rotation, and Weissenberg equator, first and second layer lines about c show it to be triclinic with the following values:

$$\begin{aligned} a_0 &= 5.49 & b_0 &= 13.07 & c_0 &= 5.79 \\ \alpha &91^\circ 18' & \beta &108^\circ 3' & \gamma &99^\circ 44' \\ \lambda &84^\circ 58' & \mu &71^\circ 20' & \nu &78^\circ 00' & x'_0 &= 0.325 & y'_0 &= 0.093 \\ a : b : c &= 1.4200 : 1 : 0.4438 \end{aligned}$$

The powder pattern (see Table 3) [column 1, Table 1, this study] closely resembles that of monetite and it has been suggested (Mrose, *priv. commun.*) that chavesite and monetite may be isostructural. The X-ray powder pattern can be adequately indexed using the above values for the elements.

The original material studied by Murdoch was obtained from the Department of Earth and Space Sciences

of the University of California at Los Angeles. In a locked cabinet containing a portion of Murdoch's old research material, several specimens and three mounted crystals were found labeled “chavesite” from “Boqueirão” in Murdoch's own hand. These matched the physical description given above and can reasonably be assumed to be the type specimens of chavesite.

A Gandolfi 114.6-mm X-ray film of the chavesite was compared with one obtained from monetite from Mona Island, Puerto Rico (NMNH no. 128714). In each case, multiple crystal fragments were used to maximize randomization of crystal orientation. The films were found to coincide in every detail. The powder diffraction data for chavesite reported by Murdoch are provided in Table 1, along with the powder data for chavesite obtained in this study and the powder pattern of monetite calculated from the structure data of Catti et al. (1977). The discrepancies between the chavesite patterns could in part be the result of preferred orientation, grinding effects, or contamination in Murdoch's sample. The cell parameters for chavesite refined from our powder data with monetite indexing are $a = 6.921(5)$, $b = 6.643(6)$, $c = 6.988(7)$ Å, $\alpha = 96.25(5)$, $\beta = 103.87(6)$, $\gamma = 88.32(6)^\circ$. These are very similar to those determined for monetite by Catti et al. (1977), $a = 6.910(1)$, $b = 6.627(2)$, $c = 6.998(2)$ Å, $\alpha = 96.34(2)$, $\beta = 103.82(2)$, $\gamma = 88.33(2)^\circ$.

Precession X-ray films for chavesite and monetite were also found to be identical. One of Murdoch's crystals of chavesite, still mounted on its original spindle, was used in the precession study. This crystal proved to be a single individual and probably corresponds to the “cleavage sliver” used in Murdoch's determination of the symmetry and cell dimensions. A newly mounted crystal taken from one of Murdoch's specimens yielded similar precession patterns. The cell parameters reported by Murdoch could not be duplicated in the precession study nor could any way be found to derive them from the monetite cell. We must assume that Murdoch was in error in his interpretation of the Weissenberg films.

A chavesite crystal from one of the type specimens was subjected to electron microprobe analysis, yielding CaO

TABLE 1. X-ray powder data for chavesite and monetite

Chavesite						
Murdoch		This study*		Monetite (calc**)		
<i>l</i>	<i>d</i>	<i>l</i>	<i>d</i>	<i>l</i>	<i>d</i>	<i>hkl</i>
10	6.33	10	6.75	10	6.757	001
5	5.03	2	5.05	3	4.990	011
5	4.56					
5	4.35	2	4.36	2	4.394	111
5	3.89	1	4.08	3	4.280	101
10	3.69	2	3.72	3	4.028	111
5	3.54			1	3.702	111
5	3.48	3	3.48	7	3.486	111
100	3.35	80	3.366	52	3.378	002
				45	3.355	200
				5	3.354	102
				18	3.337	201
				5	3.293	020
5	3.24	1	3.317			
5	3.18					
5	3.13	10	3.129	15	3.127	112
5	3.076?			3	3.093	021
20	3.023					
30	2.945	100	2.961	34	2.960	120
				41	2.953	120
				25	2.936	121
				3	2.912	211
5	2.87	1	2.896	5	2.884	012
				2	2.867	112
5	2.81					
20	2.74	10	2.760	10	2.765	102
				18	2.756	201
20	2.72	20	2.728	28	2.726	202
				6	2.715	121
5	2.66					
5	2.63	1	2.601	1	2.580	211
5	2.56			2	2.531	121
10	2.489	15	2.496	14	2.495	022
		1	2.342	1	2.347	220
10	2.305	5	2.302	6	2.307	103
				12	2.252	003
30	2.23	20	2.246	4	2.242	022
				8	2.233	122
				4	2.214	122
10	2.198	10	2.202	5	2.204	013
				6	2.195	030
5	2.155	7	2.159	9	2.157	031
				5	2.139	311
5	2.124	1	2.132	4	2.120	310
				4	2.088	130
10	2.087	1	2.099	3	2.072	221
10	2.034	2	2.038	5	2.033	122
				4	1.997	212
10	1.978	4	1.998	4	1.987	301
				1	1.959	023
		1	1.959	1	1.958	213
				1	1.958	213
20	1.918	30	1.918	15	1.916	321
		2	1.868	5	1.869	223
				6	1.851	222
20	1.85	30	1.852	15	1.848	320

TABLE 1.—Continued

Chavesite						
Murdoch		This study*		Monetite (calc**)		
<i>l</i>	<i>d</i>	<i>l</i>	<i>d</i>	<i>l</i>	<i>d</i>	<i>hkl</i>
20	1.79	5	1.799	6	1.798	123
				4	1.793	313
5	1.75	4	1.755	4	1.753	132
				3	1.739	104
				4	1.729	114
30	1.725	35	1.728	6	1.727	401
				6	1.724	321
				13	1.723	322
				5	1.693	203
10	1.685	4	1.691	5	1.684	231
				5	1.680	321
				4	1.668	402
5	1.657	2	1.657	3	1.663	033
				4	1.654	323
		2	1.643	5	1.641	123

* Obtained with 114.6-mm Gandolfi camera, CuK α , Ni-filtered radiation ($\lambda = 1.54178$ Å), visually estimated intensities.

** Calculated from the structure data of Catti et al. (1977). Calculated lines for which $l < 3$ have not been included unless they correspond to observed lines.

39.6, MnO 0.6, FeO 0.2, P₂O₅ 50.3. This compares reasonably well with the theoretical composition of monetite, CaO 41.22, P₂O₅ 52.16, H₂O 6.62. The Mn noted by Murdoch was apparently determined by a qualitative test. The small amount of MnO in the material could have provided a positive microchemical test, or his sample may have been contaminated by lithiophilite or huréulite.

The obvious conclusion from the foregoing is that chavesite is identical to monetite. The Commission on New Minerals and New Mineral Names, IMA has approved the discreditation of chavesite as a distinct mineral species. The original type material is now deposited in the Natural History Museum of Los Angeles County under catalog numbers 38919–38925.

REFERENCES CITED

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