

PARALSTONITE: A NEW MINERAL FROM THE MINERVA NO. 1 MINE, CAVE-IN-ROCK, ILLINOIS

Project 680023

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Paralstonite, previously referred to as an "unnamed barium calcium carbonate" by Roberts (1976, 1978), has been accepted as a valid mineral species by the Commission on New Minerals and Mineral Names of the International Mineralogical Association. The name, paralstonite, alludes to the mineral's morphological, chemical and crystallographic relationship with alstonite. Holotype specimen (13380), referred to as the "largest specimen" in Roberts (1978), is preserved in the National Mineral Collection at the Geological Survey of Canada.

Pertinent mineral data have been summarized in Tables 1 to 4. Additional information, not previously published, have been incorporated within the tables and marked with an asterisk. The crystal structure of paralstonite is presently being undertaken by Dr. J. Zemann and colleagues at the Institute for Mineralogy and Crystallography, Wien University, Austria.

Table 1
Crystallographic data for paralstonite

Crystal System	Hexagonal (Trigonal)
a (Å)	8.692 (3)
c	6.148 (4)
c/a	0.7073
Space Group	P312 (149); P321 (150), P3ml (156), P31m (157), P3̄1m (112), P3̄ml (164) [†]
Volume (Å ³)	402.24
Z	3
*G (meas.)	3.60(2) ^{††} g/cc
G (calc.)	3.62 g/cc
[†] partial structure determination indicates space group P321 (Dr. J. Zemann, personal communication August 1979)	
^{††} Berman balance on 8.73 mg of hand picked crystal fragments from hototype specimen.	

Table 2
Electron microprobe analysis of paralstonite

	wt. %	molecular ratio
BaO	45.6	0.2985)
CaO	18.8	0.3365) 0.6854
SrO	5.2	0.0504)
CO ₂ (calc.)	30.0	0.6844
Total	99.6	
Analytical Formula [†]	: Ba _{0.872} Ca _{0.983} Sr _{0.147} (CO ₃) ₂	
Theoretical Formula	: BaCa(CO ₃) ₂	
Molecular Weight	: 292.14	
[†] calculated assuming 6 oxygen atoms per formula unit cell.		

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Table 3
X-ray powder data for paralstonite

I/I ₀	2θ meas.	dÅ meas.	dÅ calc.	hkl
2	11.79	7.51	7.53	100
18	14.39	6.15	6.15	001
3	18.64	4.76	4.76	101
11	20.41	4.35	4.35	110
100	25.08	3.550	3.549	111
2	27.83	3.206	3.210	201
3	29.03	3.076	3.074	002
11	31.38	2.851	2.846	102
5	34.75	2.581	2.582	211
67	35.71	2.510	2.509	300
1	37.97	2.370	2.381	202
6	38.77	2.323	2.323	301
9	41.52	2.175	2.173	220
8	43.39	2.085	2.088	310
21	44.22	2.048	2.049	221
3	45.96	1.975	1.977	311
18	46.74	1.943	1.944	302
15	49.16	1.853	1.853	113
1	50.76	1.799	1.799	401
3	51.56	1.773	1.774	222
2	53.01	1.727	1.727	320
2	55.23	1.663	1.663	321
2	55.98	1.643	1.643	410
2	57.43	1.605	1.605	402
11	58.13	1.587	1.587	411
1	60.25	1.536	1.537	004
1	61.60	1.506	1.506	104
6	62.30	1.490	1.491	223
2	63.60	1.463	1.463	501
9	64.35	1.448	1.449	330
2	65.65	1.422	1.422	420
2	66.30	1.410	1.410	331
1	67.62	1.385	1.386	403
1	69.55	1.352	1.352	510
2	71.37	1.321	(1.321)	323
			(1.320)	511
8	72.04	1.311	(1.311)	304
			(1.310)	332
1	73.22	1.293	1.291	422
6	73.94	1.282	1.282	413
11	75.77	1.255	1.255	600
3	76.96	1.239	(1.238)	512
			(1.238)	430
2	77.64	1.230	1.230	005
2	78.79	1.215	(1.213)	503
			(1.213)	431

- 114.6 mm Debye-Scherrer camera; Ni filtered Cu K_α radiation;
- line intensities calculated from diffractometer trace;
- indexed with a=8.692 Å, c=6.148 Å;
- film no. 48934 corrected for film shrinkage.

Table 4
Physical and optical properties of paralstonite

Colour	: colourless to smoky white, grading to grey-white in masses
Lustre	: vitreous
Streak	: white
Fracture	: uneven
Opacity	: transparent to translucent
Tenacity	: brittle
Fluorescence	: variable, pale to bright orange under long wave ultraviolet light
Cathodoluminescence	: negative
Hardness	: between 4 and 4 1/2
Chemical Tests	: vigorous effervescence in dilute HCl
Morphological Characteristics	: euhedral crystals, maximum length 1 mm, length to width ratio approaching 2:1, hexagonal morphology with {221} pyramidal habit, hexagonal dipyramids have been observed but are rare, crystal faces are heavily striated normal to axis of elongation (c-axis) and are divided parallel to c-axis by a medial, irregular, slightly re-entrant "suture"
Optical Characteristics	: colourless in transmitted light, uniaxial negative, $n_e = 1.527(3)$, $n_w = 1.672(3)$
*Chemical Refractive Energy (Kc) [†] = 0.169	
*Physical Refractive Energy (Kp) = 0.173 for G(meas.), 0.172 for G(calc.)	
† constants taken from Mandarino (1976).	

References

- Mandarino, J.A.
1976: The Gladstone-Dale relationship. Part I: Derivation of new constants, Canadian Mineralogist, 14, p. 498-502.
- Roberts, A.C.
1976: A mineralogical investigation of alstonite $BaCa(CO_3)_2$; unpublished M.Sc. thesis, Queen's University, Kingston, Ontario, Canada.
1978: Mineralogical study of an unnamed barium calcium carbonate from the Cave-in-Rock district, Illinois; in Current Research Part C, Geological Survey of Canada Paper 78-1C, p. 49-52.