



# Mopungite

## a new mineral from



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### ABSTRACT

Mopungite occurs in the Mopung Hills, Nevada, and is named for the locality. It occurs on oxidized stibnite with selenium, sulfur, and various Sb-oxides. The specific gravity is 3.21; luster is resinous to dull; colorless to white;  $H = 3$ ,  $n_e = 1.605$ ,  $n_w = 1.614$ .

The strongest powder lines are 4.581(10), 3.985(8), 1.205(7), 1.629(5), 1.325(5), 1.265(5), 1.192(5), 3.925(4). The space group is  $P4_2/n$  with  $a = 7.994$ ,  $c = 7.859\text{\AA}$  (tetragonal). Mopungite is a member of the stottite group.

Chemical analysis of synthetic material and of an impure natural sample leads to the formula  $\text{NaSb}(\text{OH})_6$ .

### OCCURRENCE

Mopungite was discovered at the Green Prospect in the Mopung Hills, Churchill County, Nevada. The name is for the locality; mineral and name have been approved by the Commission on New Minerals and Mineral Names, IMA. The prospect is described by Lawrence (1963) as an antimony occurrence with unusual amounts of selenium, and we visited it originally because of its unusual chemistry.

At the prospect there are numerous small workings exposing loose boulders and fragments of vein matter embedded in debris representing the former shoreline of Lake Lahontan. The quartz-fluorite-stibnite vein matter was evidently weathered out and submerged in brackish water for a considerable time. Mopungite occurs as an oxidation product of stibnite; it encrusts other minerals such as stibiconite, senarmontite, romeite and tripuhyite which form pseudomorphs after stibnite crystals. Pseudomorphs of stibnite crystals up to 15 cm in length were found.

Mopungite was found in abundance only in a small hand-sorted pile of ore left by the original prospectors. With the exception of stibiconite, most of the other minerals found with mopungite were found nowhere else at the prospect. A determined search of other prospect pits and dumps revealed only stibnite and pyrite with abundant jarosite.

Well-crystallized native selenium occurs with mopungite. Native sulfur is locally abundant as granular masses in the gangue, and it ranges in color from pale yellow to rich carmine-red with increasing selenium content.

Mopungite typically occurs as small pseudocubic crystals 0.2–0.3 mm on an edge. They thickly encrust fractures which riddle the earlier Sb-oxide assemblage. The ultimate result is a breccia of Sb-oxides cemented by spongy mopungite crusts. The ore appears to have shrunk as though desiccated.

### PHYSICAL PROPERTIES

Mopungite crystals are colorless and clear to milky white with a bright glassy luster. Only once were milky white acicular crystals found. The crystals are pseudocubic and show the forms  $\{001\}$ ,  $\{110\}$  and  $\{101\}$ , but no measurable crystals were seen. The crystal faces are invariably frosted or dull and have a curious wrinkled texture. No cleavage was observed, even in thin section.

Crystals are uniaxial (-) and show no zoning or optical abnormalities. The indices of refraction (white light) are  $n_e = 1.605$ ,  $n_w = 1.614$ .

The specific gravity was estimated using Clerici solution using measured standards and found to be 3.21. The calculated density is  $3.264\text{ g/cm}^3$ . The Mohs hardness is 3. No fluorescence is observable in shortwave or longwave ultraviolet light.

### CRYSTALLOGRAPHY

Mopungite provides a crisp, clear X-ray powder diffraction pattern obtained using  $\text{CrK}\alpha$  radiation; an indexed pattern is presented in Table 1. These photographs were used to refine cell dimensions obtained from Weissenberg single-crystal films, yielding  $a = 7.994\text{\AA}$ ,  $c = 7.859\text{\AA}$ .

Rotation and Weissenberg photographs based on  $c$ -axis rotation of a single crystal establish the space group as  $P4_2/n$  (also given by Strunz, 1970, for the synthetic salt).

**Table 1. X-ray powder diffraction data for mopungite, 114 mm camera, CrK $\alpha$  radiation.**

I <sub>obs.</sub>	d <sub>obs.</sub>	d <sub>calc.</sub>	hkl
10	4.581	4.589	111
8	3.985	3.997	200
4	3.925	3.930	002
2	2.826	2.826	220
4	2.801	2.802	202
1	2.525	2.523	301
1	2.490	2.490	103
4	2.406	2.406	311
2	2.380	2.377	113
3	2.296	2.294	222
2	1.999	1.998	400
1	1.968	1.965	004
1	1.835	1.832	331
2	1.822	1.819	313
4	1.789		
4	1.784		
2	1.767		
5	1.629		
3	1.616		
3	1.540		
1	1.532		
2	1.518		
1	1.415		
2	1.404		
4	1.353		
4	1.347		
4	1.338		
3	1.332		
5	1.325		
5	1.265		
3	1.248		
3	1.217		
1	1.210		
7	1.205		
5	1.192		

**CHEMISTRY**

The synthetic compound has been known for a surprisingly long time and has been well studied. Probably the first chemist to produce NaSb(OH)<sub>6</sub> was Terreil (1866). The recipe given by Cormimboeuf (1892) was used with good effect to produce considerable quantities of pure NaSb(OH)<sub>6</sub> which were used in this study. Although there is no particular scarcity of natural mopungite, difficulty was encountered in separating pure material for analysis. The synthetic salt was examined by optical and X-ray diffraction

**Table 2. Chemical analyses of mopungite and synthetic NaSb(OH)<sub>6</sub>**

	natural		synthetic	
	1	2	3	4
Na <sub>2</sub> O	11.2%	12.8%	12.94%	12.67%
Sb <sub>2</sub> O <sub>5</sub>	57.2	65.2	65.90	65.10
H <sub>2</sub> O	(19.3)	22.0	21.0	21.8
insol.	11.1			
	98.8%	100.0%	99.84%	99.57%

1) (natural material) Na and Sb by analysis in aqueous solution using energy-dispersive X-ray fluorescence based on 243  $\mu$ g. The H<sub>2</sub>O was calculated based on the average ratios found in columns 2 and 3. Insol. is native sulfur.

2) Recalculation of 1) to 100% after subtracting insoluble native sulfur residue.

3, 4) (synthetic material) Na and Sb done by XES as above on 495 and 872  $\mu$ g; H<sub>2</sub>O by TGA on 6.70 and 5.35 mg respectively.

means (including single-crystal study) to insure that it is identical to natural mopungite. Some work was performed on mopungite as well, and results of the analyses are presented in Table 2. Note the close similarity in composition between natural and synthetic material.

Mopungite is soluble in hot water but is not visibly affected by cold water. It dissolves readily in cold dilute tartaric acid and is decomposed by hydrochloric and nitric acid.

Mopungite is a member of the stottite group.

**SPECIMENS**

A dozen or so pieces were found at the locality and they comprise some tens of milligrams of mineral. Type material will be provided to the British Museum (Natural History).

**ACKNOWLEDGMENTS**

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**REFERENCES**

CORMIMBOEUF, H. (1892) Action de la potesse et de la oude sur l'oxyde d'antimoine. *C. R. (Académie des Sciences, Paris)*, **115**, 1305-1307.  
 LAWRENCE, E. F. (1963) Antimony deposits of Nevada. *Nevada Bureau of Mines Bulletin* **61**, 32-34.  
 STRUNZ, H. (1970) *Mineralogische Tabellen*. 5 Aufl., 220.  
 TERREIL, A. (1866) Des oxydes d'antimoine cristallisés et des antimonites. *Annales de chimie et de physique*, **4**, **7**, 350-358. ☒

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