

# MURDOCHITE, A NEW COPPER LEAD OXIDE MINERAL\*

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## ABSTRACT

Chemical analysis and *x*-ray structural studies (see following paper by C. L. Christ and J. R. Clark in this issue) establish as a new species a copper lead oxide from the Mammoth mine, Tiger, Ariz. The percentage composition, CuO 67.24, PbO<sub>2</sub> 30.53, Fe<sub>2</sub>O<sub>3</sub> 0.17, SiO<sub>2</sub> 0.05, and insoluble 1.11, yields the formula Cu<sub>6</sub>PbO<sub>8</sub>. The specific gravity is 6.47 at 4° C. The mineral forms in tiny lustrous black octahedra associated with wulfenite, diopside, willemite, and fluorite.

The new mineral was found by Percy W. Porter, now deceased, of Cavecreek, Ariz., and at his request it is named in honor of Professor Joseph Murdoch of the University of California at Los Angeles.

## INTRODUCTION

The new mineral, murdochite, described in this paper is an anhydrous oxide of copper and lead from the Mammoth mine, located at Tiger, Pinal County, Ariz. It has a composition that yields approximately the formula Cu<sub>6</sub>PbO<sub>8</sub> and occurs as tiny black opaque octahedra, of which the largest is less than one millimeter in the longest dimension. The late Percy W. Porter, a mining engineer of Cavecreek, Ariz., collected this mineral with many others from the Mammoth mine. Spending approximately 300 hours and using a binocular microscope, he hand-picked the 401.5-mg. sample that he submitted for analysis.

Mr. Porter requested that if the mineral was found to be a new species it be named in honor of Professor Joseph Murdoch of the University of California at Los Angeles, in recognition of Professor Murdoch's many contributions to the science of mineralogy.

## LOCALITY AND ASSOCIATED MINERALS

The Mammoth mine is about 46 miles northeast of Tucson. The deposit that was developed by this mine was discovered about 1880 and has been worked at various times for gold, molybdenum, and vanadium and more recently for lead, zinc, and silver in primary galena and sphalerite.

The tiny black octahedra of murdochite are found on the surface of and embedded within plates of wulfenite and on the surface of crystals of fluorite. Crystals of hemimorphite, willemite that fluoresces greenish-white, and quartz are also present.

## PHYSICAL AND CHEMICAL PROPERTIES

The specific gravity of the sample of murdochite (401.5 mg) was found to be 6.47 as determined with a 5-ml fused-silica Adams-Johnston

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pycnometer (see following article). The crystals have a hardness of 4 and give a black streak.

When the mineral was treated in a small beaker with cold (1+1)HNO<sub>3</sub>, no reaction was noticed. Within one minute after the beaker was placed on the steam bath, a gas was evolved that continued coming off in good quantity until the mineral was dissolved. Owing to the paucity of sample, no quantitative measurement of the oxygen was made. Copper was determined electrolytically by deposition on a small platinum dish. Lead was weighed as PbSO<sub>4</sub>.

ANALYSIS AND FORMULA OF MURDOCHITE

	Per cent
CuO	67.24
PbO <sub>2</sub>	30.53
Fe <sub>2</sub> O <sub>3</sub>	0.17
SiO <sub>2</sub>	0.05
Insol. in HNO <sub>3</sub>	1.11
	99.10

Formula Cu<sub>6.1</sub>Pb<sub>0.9</sub>O<sub>8.0</sub>.

The chemical analysis plus the structural analysis by Christ and Clark (1955) lead to the ideal formula Cu<sub>6</sub>PbO<sub>8</sub>.

A spectrographic report by K. J. Murata lists, in addition to the elements in the above analyses, Zn, Mn, As, Mo, and V each less than 0.1 per cent.

ACKNOWLEDGMENTS

The author is indebted to Mr. Fred A. Hildebrand who took the first x-ray powder picture of the sample and suggested that it might be a new mineral.

REFERENCE

CHRIST, C. L., AND CLARK, JOAN R. (1955), The crystal structure of murdochite: *Am. Mineral.*, **40**, 907-916.

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