

Paramelaconite From Bisbee, Arizona

Evan A. Jones

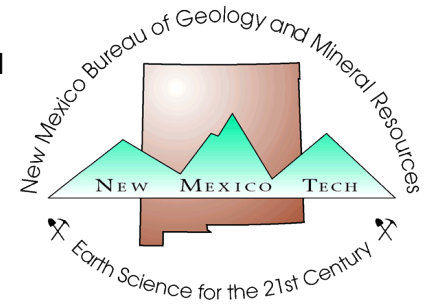
43rd New Mexico Mineral Symposium
November 10-12, 2023, Macey Center, Socorro, NM
pp.27-33

<https://doi.org/10.58799/NMMS-2023.643>

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Paramelaconite from Bisbee, Arizona

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INTRODUCTION

In 2008, the collection of Jim and Dawn Minette was offered for sale at the Tucson Gem & Mineral Show. As a collector of Arizona minerals with an abiding interest in the mineralogy of Bisbee, I was keen to acquire, if possible, the only fine example of the rare copper oxide, paramelaconite, from Bisbee that was privately owned and therefore potentially available. Bisbee is the type locality for the species and Minette had managed to acquire one in 1978. It was generally acknowledged as one of the most important specimens in his thumbnail suite. A few other good specimens exist but are in the collections of institutions including the National Museum of Natural History (Smithsonian) and the American Museum of Natural History. Upon securing the Minette specimen, I embarked on a quest to learn more about paramelaconite, the discovery and history behind the few specimens known to exist from Bisbee, and the reason for the mystique surrounding this mineral.

HISTORY

Paramelaconite was first found at Bisbee in the late 1880's but wasn't identified as a new species until 1891. No subsequent specimens were ever recovered throughout the rest of the 100-year history of the district. Adding to the intrigue, only two specimens of any significance were recovered. As a result, the species has acquired a near-mythical status among collectors. How could just two great specimens have been found at the type locality, both with impressively large euhedral crystals, when no other examples were ever identified throughout years of intense mining and specimen recovery in the district? Subsequent finds of paramelaconite in Michigan (1962), Mexico (2009) and the Democratic Republic of Congo

(2018) have excited the mineralogical world, but none approach the quality of the best specimens from the original find, and many of these are partially to completely altered to tenorite.

WHAT IS PARAMELACONITE?

Paramelaconite is an extremely rare tetragonal copper oxide. Paramelaconite crystals are purplish black in color and show typical tetragonal morphology but tend to be heavily striated due to an oscillatory combination of the {100} and {101} faces. The chemical formula for paramelaconite is $\text{Cu}_2^{(1+)}\text{Cu}_2^{(2+)}\text{O}_3$. Two much more commonly occurring copper oxides, cuprite, Cu_2O , and tenorite, CuO , contain only 1+ or 2+ oxidation states of copper respectively. In a sense, paramelaconite represents an intermediate species between the two. While cuprite and tenorite form in more typical secondary copper depositional environments and are generally stable, paramelaconite readily alters to tenorite upon exposure to air, via oxidation, sometimes forming pseudomorphs. It nearly always occurs in vugs in massive cuprite. Massive cuprite seems to serve as a mini laboratory for the deposition of paramelaconite and a host of other rare secondary copper species such as paratacamite, connellite, spangolite, buttgenbachite, gerhardtite, rouaite, likasite, graemite, and teinite. Because of the two different oxidation states of copper in paramelaconite, half of the ions are 1+ and half are 2+, and its crystal structure, which includes square planar coordination, its physical and chemical properties have been the subject of intense research for its potential use as a high-temperature superconductor and solid-state catalyst.

1890 – TWO CO-TYPE SPECIMENS
PURCHASED BY A.E. FOOTE.

The legendary mineral dealer A. E. Foote (1846-1895) of Philadelphia traveled west often in the late 19th century and visited most specimen-producing mining districts in search of minerals. It was on a trip to Bisbee in 1890 that he acquired two examples of an unknown black tetragonal mineral similar in appearance to anatase. Local lore has it that the specimens were sitting on a shelf in the assay office when they were shown to Foote, who purchased them on the spot. He could not identify the crystals and suspected a new mineral species. One specimen consisted of goethite-covered cuprite ore with a magnificent 3 cm black tetragonal free-standing crystal in the center of the rock, associated with connellite, called “footeite” at the time, which later was discredited. The other piece was a splendid large crystal plate of intergrown tetragonal crystals about 10 cm across. It was lightly coated with malachite (this specimen is considerably smaller now; fragments were trimmed off over the years). Foote took them back to Philadelphia but before they could be identified or properly studied, he sold them for \$50 apiece – not an insignificant sum for the time - to Clarence S. Bement (1843-1923), a prominent Philadelphia collector. Bement had assembled a significant mineral collection consisting of over 13,000 specimens between 1866-1900. Bement’s collection was purchased by financier J. P. Morgan in 1900 who then donated it to the American Museum of Natural History in New York City. At some point later, one of the two co-type specimens (the large crystal plate) was acquired by the Smithsonian Institution where it resides today.

1891 – PARAMELACONITE FIRST DESCRIBED AS NEW SPECIES

In 1891, Bement loaned the two unknown specimens to George A. Koenig (1844-1913), Professor of Mineralogy and Metallurgy at the University of Pennsylvania and, later, at Michigan Tech. His research determined the mineral was unrelated to anatase and was indeed a new copper oxide species unknown to science. He named it Paramelaconite (para = like;

melaconite = tenorite). Koenig published his findings in 1891 in the prestigious Proceedings of the Academy of Natural Sciences of Philadelphia. Included in the article is a splendid line drawing of the Bement specimen with the large free-standing crystal on matrix. This specimen is often acknowledged as the finest paramelaconite in existence and is currently on exhibit in the new Mignone Halls of Gems and Minerals at the American Museum of Natural History in New York.

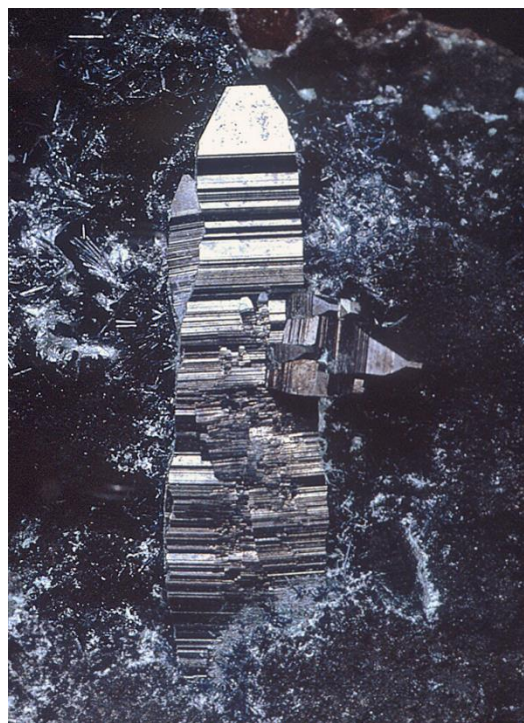


Figure 1. Paramelaconite, 3 cm xl, Czar Mine, Bisbee, Arizona, USA. One of two type specimens purchased by Dr. A. E. Foote in 1890 and sold to Clarence S. Bement. Generally acknowledged as the best specimen for the species. AMNH specimen. Richard Graeme III photo.



Figure 2. Paramelaconite, approx. 8 cm crystal plate, Czar Mine, Bisbee, Arizona, USA. One of two type specimens purchased by Dr. A. E. Foote in 1890 and sold to Clarence S. Bement. NMNH specimen. Richard Graeme III photo.

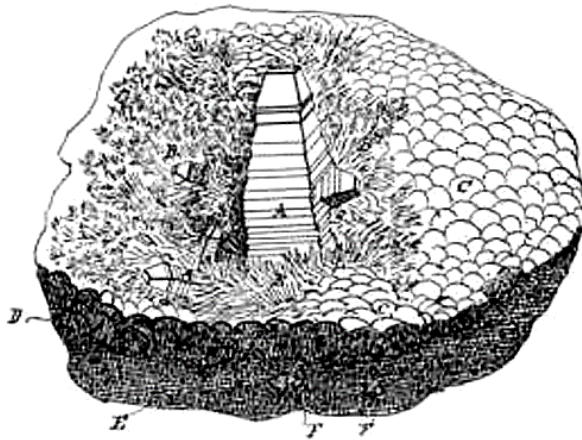


Figure 3 – Koenig’s splendid line drawing of the best paramelaconite crystal, published in 1891 in the *Proceeding of the Philadelphia Academy of Sciences*.

1941 – FRONDEL’S RESEARCH

Dr. Clifford Frondel of Harvard University performed additional analyses on a sample of paramelaconite and confirmed that Koenig got it right in 1891. Paramelaconite was indeed a valid copper oxide species in the tetragonal crystal system containing both 1+(cuprous) and 2+ (cupric) oxidation states of copper.

1962 – PARAMELACONITE FOUND IN MICHIGAN

In 1962, paramelaconite was identified in copper ore, at the A. E. Seaman Mineral Museum, that had been collected at the Algomah Mine of Upper Michigan. Crystals to 5 cm(!) were found frozen in massive chrysocolla. Somewhat pitted and lacking luster, subsequent analysis determined the crystals are mostly altered to tenorite. This probably makes sense considering chrysocolla itself is a result of the alteration of primary copper ores.



Fig. 4 – Paramelaconite crystal (6.8 mm) from the Algomah mine in Michigan. Paramelaconite was discovered there in 1962 and was studied by Sid Williams. Crystals are mostly altered to tenorite. Tom Buchholz specimen. Dan Behnke photo.

Some of the Algomah specimens were marketed by dealer Scott Williams of Scottsdale, Arizona. In his 1963 catalog he mentions that prior to this discovery, only three specimens of paramelaconite were known, all from Bisbee. What was this third piece from Bisbee? It turns out that mineralogist Sid Williams, who at the time was at Michigan Tech, during his research into the Algomah material, had located a Bisbee

paramelaconite in the A. E. Seaman Museum collection. It was described as “a small, superb group of crystals associated with connellite and malachite”. Where had this specimen come from? George A. Koenig, who had done the original work on paramelaconite in 1891, had also been a professor at Michigan Tech. Perhaps the paramelaconite had been donated by him. Was it trimmed off the large Bement plate in 1891? Is this the third Bisbee specimen dealer Scott Williams was referring to? These questions may never be answered, as the whereabouts of the Michigan Tech specimen are currently unknown, though a tiny single crystal of Bisbee paramelaconite is still in the A. E. Seaman collection. This crystal may have been trimmed from the “superb group of crystals” that Williams described.

1970's – ROCK CURRIER LOCATES ANOTHER SPECIMEN

While examining the mineral collection at Bryn Mawr College in Pennsylvania in the 1970's, Rock Currier spotted another specimen of Bisbee paramelaconite in a cabinet of drawers. This one was a thumbnail sized cluster of crystals mounted on a wooden stand. Where had it come from? Bryn Mawr College had been the recipient of the George W. Vaux Collection in 1957 and the specimen had been his. Vaux was the nephew of William S. Vaux (vauxite is named for him), and was another prominent Philadelphia area collector. Vaux's beautiful handwritten label notes the specimen was purchased from A. E. Foote in October of 1894. There is also a cost code which is undeciphered, and a notation that says “Bement”. Perhaps this means it too was trimmed off the large Bement plate. In any event, Currier was able to secure the specimen in a trade. Now there was a fine Bisbee paramelaconite in private hands!

1978 – CURRIER SELLS THE SPECIMEN TO COLLECTOR JIM MINETTE

In 1978 Currier decided to sell the paramelaconite to Jim Minette. There is an anecdotal story that Rock needed cash to

purchase a new hi-fi stereo system with the goal of impressing a lady he had been dating at the time. The specimen was sold to Minette to finance the stereo equipment. According to the rest of the story, Rock eventually showed off the new sound system to his date and proceeded to crank it up. Her response was please turn it down. In the end, Rock still had a great stereo system and Minette got an incredible thumbnail for his collection.



Fig. 5 – Paramelaconite, 2.5 cm, Bisbee, Arizona, USA. Ex-George Vaux, ex- Bryn Mawr, ex-Rock Currier and ex-Jim Minette. Now in the collection of Evan & Melissa Jones. Photo Jeff Scovil.

2008 – MINETTE COLLECTION FOR SALE AT 2008 TGMS SHOW.

When Jim & Dawn Minette's collection was marketed in Tucson in 2008 there was a long line of collectors waiting to get into the booth to purchase specimens. I was second in line. What interested me most was the paramelaconite, but what was troublesome was the fact that Ralph Clark, perhaps the most serious thumbnail collector at the time, was FIRST in line. However, Ralph reassured me he wasn't interested in the paramelaconite. I was finally

able to secure the specimen after fantasizing about owning it for years.

2009 - PARAMELACONITE FOUND AT THE OJUELA MINE IN MEXICO

The following year, Paramelaconite was identified in specimens collected from a pod of cuprite ore which had been marketed by Mike New at Top Gem Minerals. It was associated with malachite and claringbullite with paramelaconite crystals up to 1 cm. This was the first significant find of paramelaconite crystals in over 45 years. Like the Michigan material, these were found to be partly to mostly altered to tenorite but was an exciting and important find nonetheless.

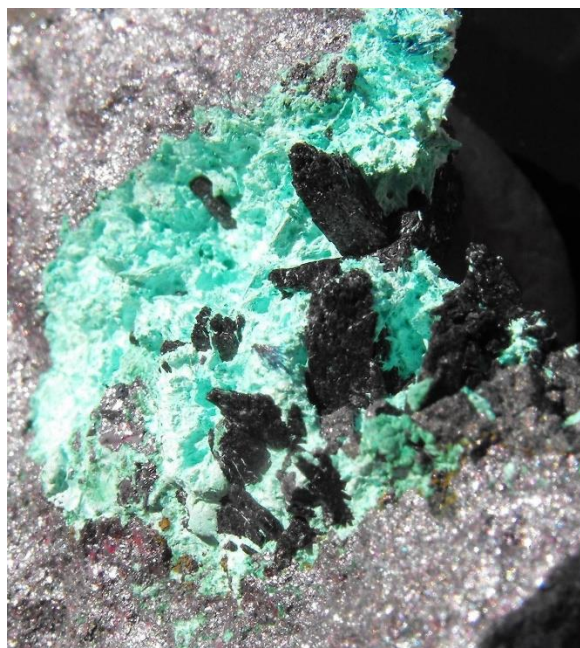


Fig. 6 – Paramelaconite, 5 cm, Ojuela Mine, Mapimi, Durango, Mexico. Found 2009. The crystals are partially altered to tenorite. Rolf Leutke specimen and photo, photo courtesy MinDat.

2018 – PARAMELACONITE FOUND AT THE TENKE DEPOSIT, D. R. CONGO

In 2018, a large batch of cuprite ore was being marketed by an African dealer at the Saint-Marie-aux-Mines show in France. Several sharp-eyed mineral dealers quickly noticed vugs of

unusual crystals within the material. Later analysis proved the crystals were extremely large examples of the copper nitrate species Gerhardtite, Rouaite and Buttgenbachite. In addition, Paramelaconite was also identified in the material. The paramelaconite crystals from this find occur as small platy groupings of crystals, as opposed to the more typical euhedral tetragonal forms for the species.

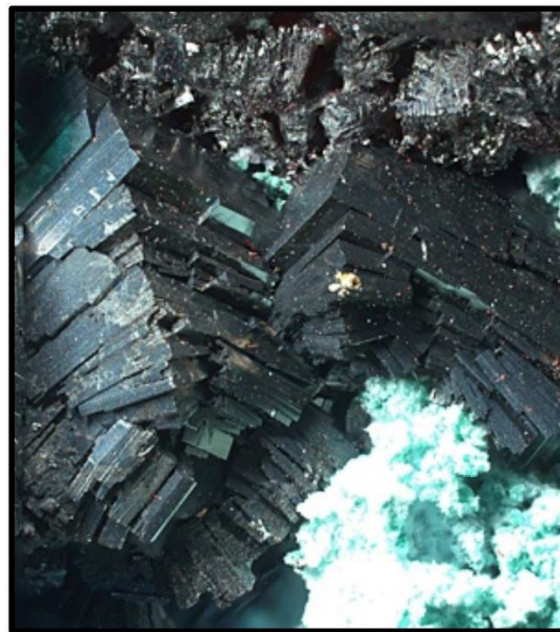


Fig. 7. – Paramelaconite, Tenke Deposit, Democratic Republic of Congo. Found 2018. Joy Desor specimen and photo. Photo courtesy MinDat.

WHAT MINE PRODUCED THE BISBEE SPECIMENS?

The locality as given by A. E. Foote for specimens of paramelaconite was the Copper Queen Mine. This is not entirely accurate. The Copper Queen Mine, the very first mine in the district, only operated from 1880-1884 and ceased ore production at that time. However, new ore bodies were discovered shortly after by the Copper Queen Mining Company and a new shaft, called the Czar, was sunk starting in 1885 to access the rich new ores. This is undoubtedly where the Paramelaconites were collected. The Czar was a large efficient and specimen-rich

mine. The paramelaconites then ended up on a shelf in the Czar Mine assay office where Foote saw them in 1890.

HOW MANY BISBEE PARAMELACONITES ARE OUT THERE?

It has always been claimed that only two specimens of paramelaconite were saved from the crushers at Bisbee. But we have seen how other specimens have turned up over the years. These have always been assumed to be trimmings off the large crystal plate from the original discovery. After all, the Bement plate is distinctly smaller than originally described (though some material was probably destroyed for analysis). However, it is also possible Foote had acquired other specimens. This speculation is based on Foote's 1891 mineral catalog, the same year paramelaconite was declared a new species. In it, we find the following advertisement: "*From Arizona – the new species described by Professor Koenig, Paramelaconite, an oxide of copper, resembling anatase, in fine large crystals*". While these specimens, which were available for purchase in 1891, could have been trimmed off the plate he sold to Clarence E. Bement in 1890, another explanation could be that he acquired MORE specimens "*in fine, large crystals*". He obviously had enough material to advertise in a catalog. This begs the question: are there more out there somewhere?

FOUND ANOTHER ONE! - ECOLE DES MINES DE PARIS SPECIMEN

During a visit to the Saint-Marie-aux-Mines show in France a couple of years ago I was enjoying the special exhibits and, much to my delight, spotted another Paramelaconite from Bisbee in a case of copper minerals. I had never seen this one before! But who owned it? The label said the fine thumbnail sized grouping of crystals was in the collection of the Paris School of Mines. What was the history of this specimen? Later, Dr. Eloise Gaillou kindly sent me the information she had on the specimen. It was donated to the collection in 1896 by a gentleman named Eckley Coxe. Logic would tell

us that the specimen likely came from Dr. A. E. Foote.



Fig. 8 – Paramelaconite, 2.6 cm, Bisbee, Arizona, USA. Donated to the Paris School of Mines by Eckley Coxe in 1896. Likely acquired from A. E. Foote. Ecole des Mines de Paris Specimen. Photo courtesy Eloise Gaillou

Now we have at least four Paramelaconite crystal clusters from Bisbee that definitely, or more than likely, came from Foote in the 1890's (five if one counts the Michigan Tech specimen which is currently MIA). In addition, there are a few small single crystals extant. The moral of the story? There may be more out there in a dusty box or drawer somewhere, overlooked for all these years. The hunt continues!

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