

HUI PŌHAKU 'Ō HAWAII

Rock & Mineral Society of Hawai'i, Inc.



VOLUME 44, NO. 6

ARSENIC, CADMIUM AND MERCURY

BY DEAN SAKABE

Our minerals for June are a very interesting trio of toxic minerals and metals. Arsenic, Cadmium and Mercury. During the Show and Tell portion of the meeting, please do not lick any of these minerals, we do want you folks to continue to show up for future meetings.

Arsenic is historically the poison of choice for many murders, in reality and fiction. Although it has been used as a poison, arsenic has many chemical uses and is quite an important element.

Arsenic does not often form in its elemental state and is far more common sulfides and sulfosalts such as Arsenopyrite, orpiment, realgar, lollingite and tennantite. Due to the abundance of these arsenic bearing ores and the rarity of native arsenic, it is not an important ore of itself. Native arsenic is found in silver ore veins and is processed along with the silver ore. Native arsenic is usually found to have a trigonal symmetry however a very rare orthorhombic arsenic is found in Saxony, Germany and is named Arsenolamprite.

Arsenopyrite (Iron Arsenide Sulfide) makes attractive mineral specimens, it has well formed

crystals. A typical crystal contains a diamond shaped dome atop a prismatic crystal. Arsenopyrite is also a major ore of Arsenic, which also happens to sometimes contain a small amounts of gold. Please note that even though Arsenopyrite is an ore of arsenic, it is not intentionally mined for Arsenic, lets be realistic, no one would intentionally mine for Arsenic. It is in the processing of ores for other elements that some arsenopyrite is "accidentally" included. In the processing the arsenopyrite releases fumes of arsenic. These fumes are then recovered to produce arsenic.

Orpiment (Arsenic Sulfide) is a rare mineral that usually forms with realgar. In fact the two minerals are almost always together.



Arsenic
Akadanimura, Echizen Province, Japan

MEETING

Wednesday

June 24

7:00—9:00 pm

Makiki District

Park

Administration

Building

NEXT MONTH

Precious Metals

LAPIDARY

Every Thursday

7pm-9pm

Second-floor Arts

and Crafts Bldg

Makiki District

Park

MEMBERSHIP

COSTS

2008

Single: \$10.00

Family: \$15.00

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Arsenic, Cadmium and Mercury Minerals, page 2

Crystals of orpiment are extremely rare as it usually forms masses and crusts. These masses can sometimes be transparent to a degree and have a gemmy quality to them. The yellow color is special to orpiment and can be confused only with a few other minerals. Orpiment is derived from the latin *auripigmentum*, or golden pigment. It has been used as a dye or pigment. However it is unstable and over time, orpiment will deteriorate into a powder. Granted the process takes a long time, also exposure to light will accelerate it. Specimens should be stored in dark, enclosed containers.

Realgar (Arsenic Sulfide) is an oddball among the sulfides. It is one of only a few sulfides that is not metallic, nor is it opaque, nor is it blandly colored. Its structure is analogous to that of sulfur and resembles sulfur in most respects except for color. The term "ruby sulfur" has been applied to Realgar.

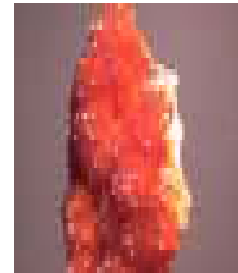
Realgar occurs in hydrothermal veins with other metal sulfide ores, its bright red color can be an aid to prospectors. It also can be found in hot spring deposits and crystallized from volcanic vapors. Realgar gets its name from the arabic words for "*powder of the mine*" (rahj al ghar). Some Realgar specimens have a deep ruby red color with an amazing clarity and a high luster, however Realgar's beauty can be fleeting. It is an unstable mineral and will alter to a different mineral, Pararealgar and eventually to powder. This process takes time and can be accelerated by exposure to light. Therefore specimens should be stored in dark, enclosed containers, and only exposed to light for brief enjoyment. Ancient Chinese carvings of Realgar are still in existence, however they are badly deteriorated. This deterioration

of realgar was thought to produce the closely related yellow orpiment, however this was recently proven to be false and the deterioration product is in fact yellow-orange pararealgar. In old paintings and manuscripts, realgar was a common pigment for paints and dyes. Many of these paintings now have a yellow or orange hue where once the color must have been an original red.

Cadmium, a soft, malleable, ductile, bluish-white metal, was discovered in Germany in 1817. Germany also remained the only important producer for 100 years. Currently, a large percentage of the global cadmium metal production takes place in Asia. Cadmium is generally recovered as a by-product from zinc concentrates. The Zinc to Cadmium ratios in typical zinc ores range from 200:1 to 400:1. Sphalerite, commonly contains small amounts of other elements, including cadmium, which happens to share similar chemical properties with zinc, and will substitute for zinc in the sphalerite crystal lattice. The resulting cadmium mineral, Greenockite (CdS), is associated with weathered Sphalerites and Wurtzites. Most of the cadmium is recovered from spent nickel cadmium batteries.



Arsenic
(Kuse Mine, near Bau, Sarawak, Borneo)



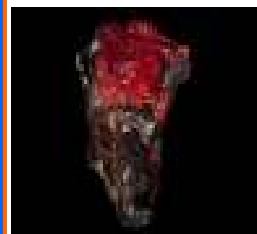
Orpiment
Elbrusskiy Mine, North
Caucasus, Russia



Arsenopyrite
Quiruvilca, La Libertad,
Peru



Orpiment
Twin Creeks Mine,
Humboldt County,
Nevada



Realgar
Getchell Mine, South Pit,
Potosi District, Humboldt
County, Nevada

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Arsenic, Cadmium and Mercury Minerals, page 3

Cadmium is primarily used for the production of rechargeable nickel cadmium batteries. To a minor extent it is also used in some pigments, coatings and plating, also as a stabilizers for plastics. Solar cells may become another market for cadmium in the future. Cadmium Telluride thin-film photovoltaics are an alternative to the traditional silicon-based solar cells and could be used in photovoltaic technology for commercial rooftop applications or other large-scale, ground-mounted utility systems.

The problem with Cadmium is that it is very toxic. Cadmium also combines with oxides, sulfides, and other carbonates. In the 1950s and 1960s industrial exposure to cadmium was high, industrial limits on cadmium exposure have been reduced in most industrialized nations. While working with cadmium it is important to do so under a fume hood to protect against fumes. Workers can be exposed to cadmium in air from the smelting and refining of metals, or from the air in plants that make cadmium products such as batteries, coatings, or plastics. Workers can also be exposed when soldering or welding metal that contains cadmium.

Mercury is a very unique metal, it is the only metal that is liquid at room temperature, having a melting point of -40 C, and a boiling point of 357 C. This silvery liquid metal is very dense and it has a high surface tension that causes it to form tiny little perfect spheres in the pores of the rocks it is found in. Many mineralogical characteristics simply do not apply to Mercury. There is no "hardness", since it cannot be scratched (nor can it scratch anything). There is no crystal structure, no fracture, no cleavage, nor does it have a streak. Please note we are talking about room temperatures. When frozen, Mercury forms crystals in the rhombohedral system at low pressure, and in the tetragonal system at high pressure.

Mercury readily alloys with a variety of metals, including gold and silver, from which common dental fillings are made. The common dental amalgam is an alloy of

silver, tin, copper, and zinc. There is a controversy regarding the mercury in dental fillings: Does this source of mercury exposure constitute a hazard? Mercury is a heavy metal and consequently a neurotoxin. However, the mercury in amalgam fillings is tightly bound to the other metals, and likely exposure due to a mouth full of fillings is perhaps 1% of the recommended maximum exposure. The bound mercury, which is in an insoluble form, is not likely to pose a risk. In any case, it is always advisable to wash your hands after handling any potentially toxic materials, including mercury and its ores.

Cinnabar (Mercury Sulfide) is a colorful mineral that adds a unique color to the mineral color palette. Its cinnamon to scarlet red color can be very attractive. Well shaped crystals are uncommon and the twinned crystals are considered classics among collectors. The twinning in cinnabar is distinctive and forms a penetration twin that is ridged with six ridges surrounding the point of a pyramid. Cinnabar was mined by the Roman Empire for its mercury content and it has been the main ore of mercury ever since. Some mines used by the Romans are still being mined today. Cinnabar shares the same symmetry class with quartz but the two form different crystal habits. One last note is that sometimes mercury specimens have started out as Cinnabar, which has been roasted to free a small part of the mercury which collects as tiny droplets in the pores and crevices of the rock.



Cadmium



Mercury
Levigiani mine,
Stazzema, Apuan Alps,
Tuscany, Italy



Cinnabar
Culver Baer mine,
Sonoma County, Calif.



Cinnabar
Clear Creek Mine, San
Benito County, California

Cinnabar (Tongren,
Guizhou Province,
China)

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DOOR PRIZES

Please note that we have instituted door prize drawings at our monthly meetings. Because of Hawaii's gambling laws, these drawings cannot be conducted in the common "raffle" format where tickets are sold. Rather, each *paid* member attending the meeting will receive a drawing ticket upon request. A voluntary donation of \$1.00 is requested and encouraged. Drawings will be conducted at the end of the meeting with available prizes awarded in random order. You must be present to win. Please remember: if you win a prize, please bring one to the next meeting. This helps to keep our drawings going. Thank you.

WE HAVE A WEBSITE!

http://pohakugalore.net/Hui_pohaku/Hiu_pohaku_1.html

MAHALO TO MARKUS FOR HELPING US GET OUT OF THE ELECTRONIC STONE AGE!

Rock & Mineral Society of Hawai'i, Inc.

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The Rock & Mineral Society meets on the 4th Wednesday of each month (except for adjusted dates in November and December) at the Makiki District Park, 7:00 - 9:00 pm. Enter from Keeaumoku Street. Parking is free but limited.

The Newsletter is published monthly, some days prior to the meetings and is distributed in electronic format by email (Adobe Acrobat PDF file attachment). Printed copies are "snail" mailed to those who do not have email. The electronic format usually contains full-color images; the print version may be limited to B&W due to reproduction costs.

Any newsletter comments are appreciated, and can be sent to elise.thomasson@gmail.com

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