The Apache Junction Rock & Gem Club, Inc.

SMOKE SIGNALS

February 2012

Officers of the Apache Junction Rock & Gem Club, Inc.		
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The Club meets on the second Thursday of every month October thru April at 7:00 pm at the Carefree Manor RV Park, at the corner of Tepee & Delaware, Apache Junction, AZ

Club Dues - $24 a year per member prorated to first of month of joining. This may be paid at the general meeting or by mail to Ron Ginn, 691 N. Velero St., Chandler, AZ 85225.

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Next Meeting – March 8, 2012

At the Carefree Manor RV Park, at the corner of Tepee & Delaware, Apache Junction, AZ.

General Meeting Minutes

Apache Junction Rock & Gem Club Minutes
February 9, 2012 Submitted by Barbara Bayer

The meeting was called to order by the President at 7:00 PM. She led the Pledge of Allegiance.

- Wally Frlich requested volunteers for the February show sponsored by our club. He stressed that a 10-15 minute orientation to volunteer was all that is needed. He distributed flyers and coupons for the show. Mr. Frlich thanked businesses who supported the show: Sticks and Stones, Legends and Dreams of Superstitions Gallery, Solid Rock, and Bead Depot.
- The secretary's minutes were accepted as published in the newsletter.
- Mattie Gadd presented the treasurer's report: Lapidary checking $3,635.67, Show checking $191.62, General checking $1,465.76, Show savings $5,679.65, Building/Lapidary savings, $1,201.59, General savings $21.23, and CD #1 $10,271.41, CD #2 $6,097.41, and CD# 3 $8,556.77.
- Ron Ginn, Membership, reported that we have 423 current members, 15 new members, renewing members 110, and 13 life members. The new members are Trey Brehm, Dawn Gruhn, Steven Hobbs, Ivan Mackey, Gary Moore, Tom O'Malley, John Shackelton, Wayne and Carolyn Sillings, Dennis and Kimberly Ursitti, Bill Wile, and Marie Williams.
- Phil Gadd, Lapidary Shop, reported that all equipment is running and the shop is having late hours every Tuesday and Thursday.
- Kelly Iverson gave the show report as the building, security, and show tables have been arranged. The high school students will have food available for purchase. He

requests that members bring rocks and items for the silent auction on Friday or the weekend. Club members may enter free with the club badge or receipt of membership fees.

- Kelly Iverson requests the members use their email addresses for the newsletter.
- Dorrie offers wire wrapping classes for $15.00 on Friday mornings, but can offer classes other days and evenings. **403-991-4231** or **ikpak@shaw.ca**

Field trip planned by Terri Creiglow is on Feb. 12, 2012 to Table Mesa for jasper. Please meet at the McDonalds in Anthem at 8 am. She will email further information for future trips.

Due to problems with the AV set up, Mr. Bayer was unable to present his lecture.

Gary Moore presented the idea of a member only vendor show for March of 2013. He would chair this event and ideally would have 40-50 vendors participate. The cost of show would be $25.00 per vendor.

Ernest Imbeault of Legends and Dreams of Superstitions Gallery spoke on the classes offered for children. Ian, one of the students, will be presenting his art on Sunday, Feb. 12, 2012 from 1-3 PM at the gallery. He has room for 125 vendors at the gallery for the bimonthly rock sale. The cost per vendor is $5.00. Services available for the vendors are credit card sales and rest rooms. He will handle the sales tax for the vendors.

John Harold, a silversmith from Sun Lakes, spoke of his 10 year experience as a silversmith. He showed examples of his work and discussed various methods of silversmithing.

Marie Williams was the 50-50 drawing winner for the sum of $56.00.

The meeting was adjourned at 8:00 pm.

Article of the Month

Diseases of Minerals

by Andrew A. Sicree

Can a mineral get sick?

Almost every mineral collector or geologist has experienced it: metastability. Fresh out of the mine, that newly-collected pyrite looks bright and shiny – as good as gold. But take it home, put it in a cardboard box in the garage, and check on it again in six months and you can see why it's called "Fool's Gold" – the pyrite has become dull, crumbly, and covered with a fine powder. Leave it in place longer and a stain develops on the cardboard below the specimen. Open the box and you notice a distinct sulfurous odor. What's up? Why is the pyrite falling apart? Pyrite is just one of many minerals that can be described as "metastable."

Metastability is the condition in which a mineral is unchanging (that is, "stable") with respect to small "disturbances" but is capable of reacting and releasing energy if "disturbed" to a great enough degree. In other words, the mineral wants to be some other mineral, but needs a small push to get there. The "disturbances" that can undo a metastable mineral can be temperature changes, increases in humidity, exposure to light, growth of bacteria, or even just the passage of time.

Diamonds aren't forever

The classic case of a metastable mineral is diamond. Diamond, a mineral composed only of carbon, is stable *where it is formed*. Diamond forms at high temperatures and terrific pressures deep within the Earth's mantle. But diamond isn't the only pure carbon mineral. Graphite is also pure carbon. The major difference between the two minerals is that diamond is cubic carbon while graphite belongs to the hexagonal crystal system. You can change graphite into diamond by putting it in a huge press and subjecting it to high enough temperatures and pressures. But, if you then lower the temperature and pressure slowly enough, the diamond you have just made will revert back to graphite. The change from diamond to graphite is known as a phase change. At room temperature and normal atmospheric pressure, graphite, not diamond, is the stable form for pure carbon. Diamond is metastable under these conditions. Some scienctists speculate that, given enough time (a billion years or so), the diamond in an engagement ring will revert back to graphite. You can greatly speed up the rate of the phase change by heating up the diamond – not an experiment I recommend. "A diamond is forever," says the

DeBeers ad campaign, but it might not be so. Sorry, guys and gals!

Glaciers are metastable, too

Ice, of course, is also metastable on the Earth's surface. Heat up a glacier and it melts. One may note that it is possible that glacier-covered planet could exist where ice is stable rather than metastable because it is always too cold to melt the ice. This emphasizes the point that metastability depends upon the local conditions. A mineral that is stable deep in the Earth's mantle may be metastable on the Earth's surface and vice versa (graphite is stable on the surface but would be metastable in the mantle).

The real question to ask about a metastable mineral is not "why is it decomposing?" but rather "why hasn't it decomposed already?" Those pyrite crystals have been underground, exposed to water for millennia, and they wait until you take them home and put them in your nice dry garage before they fall apart?

Pyrite "disease"

Even when stored in a dry mineral cabinet, some specimens of pyrite develop what is loosely called "pyrite disease." The decomposition of pyrite is hard to predict, but some pyrite crystals become dull and powdery, emit a sulfurous odor, and will stain cardboard and corrode nearby metals. Certainly, pyrite is metastable at room temperatures in the presence of oxygen and moisture. One way to write the reaction for the decomposition of pyrite is:

$$\mathbf{4FeS_2 + 10H_2O + 15O_2 \rightarrow 4FeO(OH) + 8H_2SO_4}$$

In this reaction pyrite, FeS_2, is altered to goethite, FeO(OH), and sulfuric acid, H_2SO_4, is released. The crumbly, powdery appearance is due to the alteration of pyrite to goethite and the sulfurous, acrid smell is due the production of sulfuric acid. This acid escapes from the mineral and attacks nearby cardboard, paper, and metal. Note that water, H_2O, and oxygen, O_2, are required for the reaction to proceed. The question arises: "If pyrite is metastable, then why doesn't all pyrite decompose rapidly?"

When a pyrite crystal is unearthed, it is exposed to oxygen and moisture. Even the small amount of water available in mostly dry air is sufficient to allow pyrite disease to proceed. Higher humidity air helps to decompose pyrite more readily. Some pyrite specimens are more susceptible than others to decomposition due to naturally-occurring flaws in the crystal lattice. Bacteria can also play an important role. Some bacteria make their living, so to speak, on the energy they get from the oxidation of pyrite. As the bacteria multiply, they will accelerate the decomposition of the pyrite.

Underground, in its host rock, pyrite is in a different environment. Even though the pyrite is exposed to water, the groundwater doesn't have much oxygen in it. Pyrite is stable when oxygen is unavailable, rather than metastable. The conditions under which pyrite is stable are found in what geochemists call the "reduced zone." This is the region underground where there is very little free oxygen. [By free oxygen, we mean oxygen present as a gas or dissolved in water – oxygen atoms can still be present if they are bound up in minerals such as calcite, $Ca(CO_3)$, or quartz, SiO_2, etc.] When groundwater that carries dissolved oxygen penetrates to rocks containing pyrite, the water and oxygen will oxidize the pyrite to an iron oxide mineral such as hematite, Fe_2O_3, or goethite, FeO(OH). The zone of rocks affected by oxygen-rich groundwater is referred to as the "oxidized zone." Pyrite is stable in the reduced zone and metastable (or unstable) in the oxidized zone.

Realgar dies under the lights

The metastability of realgar presents a preservation headache for the mineralogist. Upon exposure to light (for a matter of days or months) bright-red realgar crystals will alter to an orangish-yellow powder. The traditional explanation for this decomposition was that realgar (which is arsenic sulfide, AsS) was changing to a mixture of orpiment (As_2S_3) and arsenolite (As_2O_3). Note that any such reaction would require the addition of oxygen and (presumably) the evolution of sulfur dioxide gas:

$$\mathbf{8AsS + 5O_2 \rightarrow 2As_2S_3 + 2As_2O_3 + 2SO_2}$$

This equation implies that realgar could be preserved by placing it in an oxygen-free environment in a sealed glass ampoule.

But more recent investigations have shown that the photodecomposition of realgar does not produce orpiment. Careful experiments have shown that upon exposure to light in the 500 to 670 nm range, realgar alters to the mineral pararealgar. Pararealgar is the dimorph of realgar, which means that it has the same chemical composition: arsenic sulfide (AsS). Note that this reaction does not involve oxygen: $\mathbf{AsS_{(realgar)} \rightarrow AsS_{(pararealgar)}}$

This equation implies that placing realgar in an oxygen-free environment in a sealed glass ampoule will do no good. If light hits the realgar, it will decompose. Thus, realgar is metastable with respect to pararealgar – all it takes is light to make the change.

Interestingly, light under 500 nm or over 670 nm does not alter realgar. Thus, purple and ultraviolet light will not cause photo-decomposition, nor will red or infrared light.

Summary

Metastability is a relative term – it depends upon the environment of a mineral. If a mineral is exposed into conditions where is it unstable (that is, where it would react to produce other minerals and release energy) but doesn't react promptly, then we say that the mineral is metastable. A metastable mineral will begin to react if it is given a small "push" in the form of a temperature increase, exposure to light, contamination with bacteria, exposure to oxygen, etc.

Ref.: Douglass, D. L, Shing, C., Wang, G., 1992, "Light induced alteration of realgar to pararealgar," *American Mineralogist*, v. 77, pp. 1266-1274.

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The Meaning of Metamict

The principal characteristic of a crystal is *order*. A crystal's atoms are arranged in a regular three-dimensional pattern called a *crystal lattice*. It is possible, however, to destroy this ordered arrangement of atoms.

Naturally-occurring radiation, particularly *alpha particles*, will knock atoms out of their proper places within the crystal lattice. Alpha particles are hefty, consisting of two protons and two neutrons (the same as the nuclei of helium), so when they hit a crystal at high speeds they cause a fair amount of damage.

Knocked about by alpha radiation, the atoms that make up a crystal are still in the crystal, but their order has been destroyed. This process is called *metamictization* or *metamiction* and a crystal subjected to it is said to be *metamict*. The term *amorphous* is a general term for a mineral without crystallographic order (i.e., without any interior order); metamict is applied to minerals that originally had order, but lost it due to bombardment by radioactivity.

Metamictization lowers a mineral's hardness, density, and index of refraction. It often changes the mineral's color, too. Metamict minerals are often brown, tan, or greenish. The external form of the crystal (its crystal faces and habit) may be preserved even though, on an atomic level, the crystal has become completely disordered.

Minerals that contain uranium or thorium – elements that are always radioactive – are subject to metamictization. In these cases, internal bombardment occurs as uranium or thorium atoms within the crystal decay and release alpha particles. Minerals that do not contain radioactive elements, but occur in deposits that contain uranium or thorium, can also become metamict by external radioactive bombardment.

Zircon ($ZrSiO_4$) is an example of a mineral that is often found in metamict form. Zircon does not contain uranium or thorium, but it is susceptible to metamictization when bombarded by alpha particles from nearby radioactive minerals. Not all zircon is metamict, however. The terms *low zircon* and *high zircon* are used to differentiate, respectively, zircon metamict and non-metamict zircons. Other minerals that are often found to be metamict include *titanite* ($CaTiSiO_5$) and *ekanite* ($ThCa_2Si_8O_{20}$).

Rock Shows in February

1-29—QUARTZSITE, ARIZONA: Wholesale and retail show; Desert Gardens RV Park; 1064 Kuehn St.; I-10 Exit 17; Daily 9-6; free admission; crystals, minerals, rough, polished, jewelry, lapidary equipment; contact Sharon or Sandy, 1064 Kuehn St., Quartzsite, AZ 85346, (928) 927-6361; e-mail: info@desertgardensrvpark.net; Web site: www.desertgardensrvpark.net

March

3-4—FOUNTAIN HILLS, ARIZONA: 3rd retail show; Rick Obermiller; Fountain Hills Community Center; 13001 N. La Montana Dr.; Sat. 10-5, Sun. 10-4; adults $2, children (under 10) free; 15 dealers, gems, minerals, crystals, fossils, beads, metals, kids' gold panning and fossil dig, door prizes, raffles; contact Rick Obermiller, PO Box 64281, Phoenix, AZ 85082-4281, (602) 826-2218; e-mail: obrocks@gmail.com

8-11—DEMING, NEW MEXICO: 47th annual show and sale; Deming Gem & Mineral Society; SWNM Fairgrounds; Raymond Reed Blvd.; Thu. 9-5, Fri. 9-5, Sat. 9-5, Sun. 9-5; free admission; more than 100 dealers, displays, geode cutting, gold panning, spinning wheel, silent and live auctions, door prizes, raffle, guided field trip; contact Maurice Crawford, 713 W. Spruce PMB 726, Deming, NM 88031, (575) 546-0056; e-mail: mauryjudy@yahoo.com; Web site: dgms.bravehost.com

17-18—COTTONWOOD, ARIZONA: Retail show; Sharon Szymanski; Mingus Union High School; 1801 E. Fir St.; Sat. 10-5, Sun. 10-4; adults $3, children (under 12) free with adult; dealers, custom and fine jewelry, gold and silver, rocks, slabs, cabochons, beads, rough, unset gemstones, crystals, lapidary machinery and supplies, wirewrapper; contact Sharon Szymanski, 1792 E. Laddoos Ave., San Tan Valley, AZ 85140, (480) 215-9101; e-mail: goldcanyon2@yahoo.com

24-25—YUMA, ARIZONA: Annual show; Sharon Szymanski, Val Latham; Yuma Civic Center; 1440 Desert Hills Dr.; Sat. 10-5, Sun. 10-4; adults $3, children (under 12) free with adult; dealers, fine and costume jewelry, gems, beads, slabs, cabachons, fossils, lapidary supplies and machinery, wire wrapping on the premises; contact Sharon Szymanski, 1792 E. Laddoos Ave., San Tan Valley, AZ 85140, (480) 671-6191; e-mail: goldcanyon2@yahoo.com