The Conglomerate

Newsletter of the Baltimore Mineral Society
www.baltimoremineralsociety.org
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July Meeting: What's New In Minerals

One of the highlights at the annual Rochester Mineralogical Symposium each year is a photo roundup entitled "What's New in Minerals" presented by world class mineral photographer Jeff Scovil. The room is always packed and lots of "oohs and aaahs" are always heard as image after image is projected on the large screen.

Although based in Phoenix, AZ, Jeff spends much of the year travelling to all the large mineral shows (Denver, Tucson, West Springfield, Munich, St, Marie aux Mines etc.) and photographs minerals owned by private collectors. During his travels, he spends much of his time photographing outstanding specimens the best and most interesting appear in his annual roundup at Rochester each year.

For those who have never taken advantage of the opportunity to attend the Rochester Mineralogical Symposium, or any of the "big shows", this program will give you a small opportunity to see just some of what you've been missing.

As usual, we'll meet at the Natural History Society of Maryland on Belair Rd. If you need directons,visit our website <baltimoremineralsociety.org>. Jim Hooper will host the meeting which will begin at 7:30 pm.

Do come and be impressed.

Color in Minerals—Part XIV: Two Oxide Gems—Spinel and Corundum

by Al Pribula

As is true of silicates, oxides often have the properties which make for a good gemstone (hardness, durability, availability in good crystals, clarity, etc.). Two oxides which are used frequently as gemstones are spinel and corundum. They are sometimes found as good crystals *in situ* in the host rock, but, because of their hardness and durability, they weather less readily than the host rock. This means they are frequently found in alluvial deposits called *gem gravels* after they have weathered from the host rock and been carried away by running water. The gem gravels of Montana in the US, and in Sri Lanka, Thailand, and Myanmar (Burma) have yielded many thousands of beautiful gemstones, most frequently the two species discussed here.

The mineral spinel is magnesium aluminum oxide ($MgAl_2O_4$). It is the namesake of a group of more than twenty oxide minerals which can have many different cations of +2 charge (such as Fe^{2+}, Zn^{2+}, Mn^{2+}, Co^{2+}, and others) in place of the Mg^{2+}, and many different cations of +3 charge (such as V^{3+}, Cr^{3+}, Fe^{3+}, and others) in place of the Al^{3+}. This means that minerals of the spinel group can act as something of a "garbage can" for whatever cations are in the mixture from which they are crystallizing, and that pure end-members of the group are rare. As a result, samples labelled as "spinel" can have a dizzying array of possible compositions. From the perspective of

continued on page 4

Baltimore Mineral Society

The BMS was established in order to allow its members the opportunity to promote the study of mineralogy and to act as a source of information and inspiration for the mineral collector. We are members of the Eastern Federation of Mineralogical Societies and affiliated with the American Federation of Mineralogical Societies.

Meetings are held the 4th Wednesday of each month (except November,, December, June & August) at the Natural HIstory Society of Maryland beginning at 7:30 p.m. Visit the club website <www.baltimoremineralsociety.com> for directions.

Yearly dues are $10 for individual members and $15 for family memberships. Send payment along with your name, list of family members, if applicable, address, phone and e-mail to: BMS, PO Box 302; Glyndon, MD 21071-0302.

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Write for "The Conglomerate"!
Send news, announcements, comments, observations, or articles to <mseeds at fandm.edu>. No e-mail? Hand in your submission at a meeting.

President's Postings

by Jim Hooper

The near-end of July draws nigh and the abundance of rain in April and May has now been replaced with the heat and sun and things are beginning to turn a little browner. We here at the BMS newsletter editorial offices hope you've had opportunity to enjoy some out-door adventures when the weather permits. These adventures would include of course the more recently held Wildacres workshops in the very green, mountainous areas of Little Switzerland, North Carolina. The BMS was represented by several members at the Wildacres gathering and we look forward to hearing about the adventures at our society meetings and in the newsletter!

We've had the great fortune to celebrate our annual picnic event at the home of Linda Watts and Al Pribula whom we'd like to thank once again for providing a great place for gathering, enjoying some great food, and catching up with one another.

That said, I offer you this ditty from 'The Curious Lore of Precious Stones' by George Frederick Kunz on the birthstone of July, Turquoise.

The heav'n-blue turquoise should adorn
All those who in July are born;
For those they'll be exempt and free
From love' doubts and anxiety.

So there you are. Love and romance are set on a happy course as long as you have some Turquoise in your collection.

We'd love to hear and share your poetic observations on the birthstone for July, Turquoise, or just about any other gemstone or mineral. Share your 'ditty', even if it's your first. Send it along to Mike Seeds, Editor.

And thank you Jake, for your presentation on Maryland Minerals at the May meeting!

See you all at the July meeting!

JH!

Short Issue This Month

Our faithful editor Mike has climbed into his shoebox as he prepares to move into his new home, thus we have a short issue this month. We wish Mike and Janet many happy and healthy years in their new abode.

Minutes From our Last Meeting

by Jake Slagle, Secretary

President Jim Hooper called the May 24th meeting to order at 7:40 p.m. Minutes of the previous month's meeting were accepted as printed.

Officers Reports - None

Unfinished Business - None

New Business - None

Announcements:

In the absence of Al Pribula, Mike Seeds reminded all of the club picnic scheduled for June 25 at 5 p.m. and expressed appreciation on behalf of the Society to Al and Linda for holding it at their house.

Mineral of the Month - Mimetite

One specimen of mimetite from Mexico was shown.

After a brief break, Jake Slagle gave a PowerPoint presentation featuring unusual, uncommon, extreme, and spectacular Maryland-collected minerals.

The meeting adjourned at 9: 15 p.m.

Submitted by,
Jake Slagle, Secretary

Field Trip Ideas?

With the cooler weather of fall soon upon us, our thoughts turn back to field collecting.

Do you have any ideas for a fall collecting trip? If so, give Field Trip Coordinator Bob Eberle a call (410-661-8436) and let him know where you think the club should go for its next trip. Don't wait too long since it takes Bob time to make the arrangements with the quarry or property owner!

Mineral of the Month—Dioptase $Cu_6Si_6O_{18}\cdot 6H_2O$

by Steve Weinberger

Dioptase is a beautiful emerald green to dark bluish green, trigonal mineral often terminated by a rhombohedron. It was named in 1797 by Hauy from the Greek for "through" and "to see" in allusion to the visibility of internal cleavage planes. It has a vitreous luster, its streak is pale green, has perfect cleavage on the 1011, hardness of 5 and density of 3.3. It does not fluoresce.

Dioptase
Kimbedi, Pool Region
Republic of Congo
Photo: R. Lavinski, I-Rocks via Wikimedia Commons

Dioptase occurs in the oxidation zone of copper ore deposits, usually in dry regions. In this country, it is found in La Paz Co. AZ and in micro crystals at the Mammoth-St. Anthony, Tiger, Pinal Co. AZ mines.

Dioptase can also be found In other world-wide locations such as Argentina, Peru, Kazakhstan, Congo, Tsumeb and Namibia.

Dioptase, Wulfenite
Mammoth-St Anthony Mine,
Tiger, Mammoth District
Pinal Co. AZ
Photo: R. Lavinsky, I-Rocks.com via Wikimedia Commons

Dioptase
Kimbedi, Pool Region
Republic of Congo
Photo: R. Lavinski, I-Rocks via Wikimedia Commons

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Color in Minerals

continued from page 1

this series, this is both good and bad. It's good because gem spinels can occur in a wide range of colors (like in the garnet group, except that spinel can also be blue), but it's bad in that there are often multiple causes of color in a single sample, or multiple explanations for the same color in different samples, making explanation of its colors a complicated and often confusing task.

Most of the colors which can be exhibited by spinel are a result of the presence of transition-metal ions substituting for either the Mg^{2+} or the Al^{3+}. Some of these have been previously mentioned in Parts VI and X of this series. The most commonly-seen gem spinel colors are red ("ruby spinel," due to *d-d* transitions in Cr^{3+} as discussed in Part X) and blue (probably due to *d-d* transitions in Co^{2+} as mentioned in Part VI, but which has also been attributed to iron). However, it can also be greenish-blue due to *d-d* transitions in Ni^{2+}, teal blue-green from a combination of Co^{2+} and Ni^{2+}, plum-red when V^{3+} is present along with Cr^{3+}, yellow or brown due to Fe^{3+}, violet/purple from Cr^{3+} and iron (not specified as to whether it's Fe^{2+} or Fe^{3+}), and bluish-green from a combination of *d-d* transitions in Fe^{2+} and Fe^{3+} with $Fe^{2+} \rightarrow Fe^{3+}$ charge-transfer (CT) transitions. And those are just the ones that have been sufficiently studied to determine the exact cause of their colors—there are almost certainly many other combinations of causes which produce many of the other colors which spinel can exhibit. Many "spinel" samples containing significant Fe^{2+} and Fe^{3+} (i.e., when they are grading into magnetite ($(Fe^{2+})(Fe^{3+})_2O_4$)) are black due to $Fe^{2+} \rightarrow Fe^{3+}$ CT transitions, as mentioned in Part IX of this series.

The mineral corundum is aluminum oxide (Al_2O_3). It is one of the hardest known substances (hardness 9 on the Mohs scale) and is very tough and durable. It is a fairly common mineral, but many of its specimens are not much to look at. Often, they show a massive or granular material with little distinct crystalline structure. Pure Al_2O_3 is colorless because the electronic transitions in Al^{3+} and O^{2-} require more energy than can be supplied by visible light. However, I suspect that a truly pure sample has never been found naturally. When found in nature, it is often a dark brown, gray, blue-gray, or black color due to the presence of impurities such as the oxides of iron, manganese, and/or chromium. Granular samples (often mixed with spinel and/or hematite and/or magnetite) are called *emery* (no, not named for our fellow BMS member Bernie E.) and are pulverized and used as an abrasive. The synthetic material (often called alumina) is also used as an abrasive on sandpaper and lapidary grinding wheels. When corundum crystals are found, they are most commonly hexagonal and usually flattened or barrel-shaped prisms (very often with rounded edges and corners), but can also occur as flattened rhombohedra.

However, it is occasionally found as gemmy, transparent (or nearly so) samples, and these are frequently polished and used as gemstones. (Even opaque samples are sometimes cut into cabochons or beads.) When these are a deep red or purplish-red color, they are called rubies, and, when any other color, they are called sapphires. (Yes, the most common color for sapphire is blue, but that name is used for all non-red corundum stones.) Along with diamond and emerald, these are two of the gemstones often referred to as "precious stones," with all others (spinel, aquamarine, amethyst, tanzanite, hiddenite, topaz, etc.) being "semiprecious." Ruby is the birthstone for July and (blue) sapphire for September. Samples containing oriented inclusions of rutile or other minerals can be cut into "star" stones, as discussed in Part IV of the series. In black "star sapphires," oriented hematite inclusions are the cause of both the color and the asterism. The beauty and value of rubies has caused humans to wax poetic: "The price of wisdom is beyond rubies." (Job [28:18]); 'They brought me rubies from the mine,/ And held them to the sun,/ I said "They are drops of frozen wine/From Eden's vats that run."' (from "Rubies," by R. W. Emerson).

The origin of the red color in rubies is *d-d* transitions in Cr^{3+} ions when they substitute for Al^{3+} ions; this was discussed in Part X of the series. In order for corundum to have the color we associate with ruby, approximately 1-3% of the Al^{3+} ions need to be substituted by Cr^{3+}. Below that level, the color is pale and the sample would be called a pink sapphire (although the misleading name "pink ruby" is sometimes applied to these samples). Above that level, the red color diminishes and a green component is added, giving the sample a grayish tinge. As the amount of chromium increases, the red component decreases still more and, at the point when about 25% of the Al^{3+} ions have been replaced by Cr^{3+}, the sample is an unattractive gray color. Going to higher

continued on page 5

Color in Minerals

continued from page 4

amounts of Cr^{3+}, the color gradually changes from gray to green, which is the color of pure Cr_2O_3, as discussed in Part X of the series.

The color also can be modified by the presence of other metal ions. If Fe^{3+} is present with the chromium, the color is a more brownish red; if V^{3+} is present, the color is a purplish-red. The color of ruby is enhanced by the fact that it is also fluorescent, strongly so in UV light, and weakly so in daylight (which has a UV component to it). The color of the fluorescence is almost the same as the color produced by the *d-d* transitions in Cr^{3+}, enhancing the observed color of the stone.

But what about the other colors which corundum can exhibit? Sapphires are most commonly blue, but they can be found in yellow, green, violet, and orange, and can show an alexandrite-like color change as well. The typical blue color is due to a combination of *d-d* transitions in Fe^{2+} (and sometimes Ti^{3+}) with $Fe^{2+} \rightarrow Fe^{3+}$ and $Fe^{2+} \rightarrow Ti^{4+}$ CT transitions. Pinkish-orange "Padparadscha" sapphires are colored by Cr^{4+} as discussed in Part X. An orange to orange-brown color is produced by *d-d* transitions in Cr^{3+} and Fe^{3+} plus a color center of some sort. A green color can be produced in a variety of ways. It can result from a combination of *d-d* transitions in V^{3+} and Co^{2+}, or a combination of *d-d* transitions in Fe^{2+} and Fe^{3+} with $Fe^{2+} \rightarrow Ti^{4+}$ CT transitions, with a contribution from *d-d* transitions in Ti^{3+} and/or Cr^{3+} in some cases. Samples containing V^{3+} can have a purple color, or can show an alexandrite-like color change (green in sunlight, red in incandescent or candle light). Violet/purple stones result when both blue and red chromophores are present. This can be red from Cr^{3+} and blue from $Fe^{2+} \rightarrow Ti^{4+}$ CT, but can be a different combination in other cases. Ni^{2+} produces a yellow color in corundum, and can add a yellowish tinge to green sapphires when present along with Cr^{3+}. The presence of Fe^{3+} substituting for some of the Al^{3+} ions gives its typical yellow-brown color. If this is present along with Ti^{3+}, a greenish component is added, while $Fe^{2+} \rightarrow Fe^{3+}$ and $Fe^{2+} \rightarrow Ti^{4+}$ CT transitions add blue. Different combinations of these chromophores can give samples a yellow, greenish-blue, blue, or blue-violet color. A yellow color can have a number of different causes: *d-d* transitions in Fe^{3+} (including a rare type in which there is simultaneous excitation of an electron on two Fe^{3+} ions), lattice imperfections, a color center of some sort, or $O \rightarrow Fe^{3+}$ CT transitions. Irradiation of corundum samples can produce a yellow color (probably due to a color center), but this color fades in sunlight. As with spinel, there are undoubtedly other combinations of color causes which can exist to produce virtually any color of the spectrum.

Since both ruby and (blue) sapphire are so valuable as gemstones (and for applications such as ruby lasers and "jewels" for watches and clocks), it should come as no surprise that both of them have been produced synthetically and have also been the subject of many treatments to enhance their appearance (and therefore, their salability). In synthetic sapphires, Co^{3+} produces a green color, Mn^{2+} or Ti^{3+} produces pink, Fe produces blue-green, a combination of Ni^{3+} and Cr^{3+} produces yellow to brown, and a combination of Fe and Ti produces blue (probably from $Fe^{2+} \rightarrow Ti^{4+}$ CT transitions as in natural blue sapphire). An e^- color center is the cause of a yellow color in synthetic corundum. Paler blue iron-containing stones sometimes lose their blue color and turn gray when heated, but the blue color can be successfully intensified by an electrolytic treatment to oxidize part of the Fe^{2+} present to Fe^{3+}. Exposure of corundum to vapors of beryllium or heating with powdered chrysoberyl (so that some of the Be diffuses into the structure as Be^{2+}) typically produces colors in the yellow to orange range, but pink, pink-purple, blue, or other colors can also be produced, depending on the exact details of the treatment and the impurity ions already present in the corundum sample. Originally, stones treated in this way changed color only in a thin surface layer (and thus were fairly easy to detect), but "deep" treated stones have been produced more recently. A long discussion of this process and its results was published in the Summer, 2003 issue of Gems & Gemology magazine. Heat-treatment of some iron-containing samples can produce an orange-yellow color due to exsolution of hematite. Kurt Nassau's books (The Physics and Chemistry of Color, Gems Made by Man, and Gemstone Enhancement) contain additional information about synthetics and treatments (of many gemstones, not just corundum), and many issues of Gems and Gemology magazine have more recent information about this subject.

The East Coast Gem, Mineral & Fossil Show

by Carolyn Weinberger

Yes, it's a longish ride from Baltimore to West Springfield, but with 200+ dealers, the show is well worth the trip as it's the closest thing to Tucson we can get.

Dealers range from the high end folks to the reasonably priced, all featuring a good selection of minerals, etc. to entice you (or your camera). There are also several jewelry, lapidary and fossil dealers, but the majority of the 200+ vendors specialize in minerals. The show is a feast for the eyes!

The show is a commercial show rather then a club show, but if you didn't know, you really couldn't tell. Several talks are presented each day - this year featuring Bob Jones, Les Presmyk, and Kevin Downey.

Bob is the Sr. Editor for Rocks & Gem Magazine, a frequent speaker at the EFMLS Wildacres Workshops, and a world traveler. He'll talk about the Milpillas Mine Azurites, Wulfenite and some of his favorite collecting adventures.

Les Presmyk is a mining engineer by profession, owner of "DeNatura Minerals" and lives in Arizona. He's amassed an amazing collection of Arizona minerals and will give talks about the copper minerals of Arizona and about the famous Red Cloud wulfenite locality (which at one time he and a friend owned). Les will also be the featured collector at the show with some 50 display cases of his minerals.

Kevin Downey, owner of "Well Arranged Molecules" is also an excellent photographer specializing in underground cave photography. His talk will be on "Hunting Columbian Emeralds".

One of the highlights of the East Coast show each year are the display cases. One (or sometimes two) world class mineral collectors is invited to display thier collection. Filling about 50 cases, the minerals shown are always outstanding and well worth the cost of admission. This year Les Presmyk will be the featured presenter. Steve and I have seen many of specimens which we're sure he'll display at West Springfield and can assure you that you're in for a treat.

Info at < /www.mzexpos.com/east-coast-show>.

A Mineral That Was as Good as Gold

by Homer Eshbaugh, from MWF News, November 2008

Once upon a time, a mineral we now consider common was "worth it's weight in gold" - literally! That mineral is halite, more commonly known as salt. NaCl. It is a critical nutrient to all animal life, including humans. In fact, it is so important to survival that one of our four tastes was developed to detect it. (We can actually taste only four things: sweet, sour, bitter, and salty. Flavor, what we usually think of as "taste," is actually a combination of taste and aroma, i.e., what we smell.)

The phrase "not worth his salt" comes from the ancient Greeks, when salt was used to pay for slaves. Roman soldiers were sometimes paid in salt. In fact, our word for monetary payment for work, "salary," comes from the Latin for salt—sal. Our word "salad" (from the Latin "saltar," meaning "salted") comes from the Roman habit of salting their fresh greens.

Today, many town names reflect their origins as sites of ancient or medieval salt mines or salt springs. "Wich" or "wytch" is the Old English word for "brine well" (what we now call a salt springs) and is seen in names like Northwich and Middlewich. The German word for salt, "salz," appears in Salsburg ("salt city"), a large city located on the Salzach (meaning "saltwater" or "brine") River.

As with many precious materials, ancient lore grew around salt. It was so precious that the spilling of salt was deemed by the ancient Romans to be the work of the Devil. Salt thrown over the left shoulder (where evil lurks) was believed to drive the Devil away.

Let's Spice Things Up!

Many of you have taken vacation trips this summer and we're interested in hearing about your mineral connected adventures. How about adding some zest to the Conglomerate by sharing a bit about those adventures via these pages.

You don't have to be a professional author - just send in your tales to editor Mike along with any photos you may have to add some interest.

Upcoming Events

July:

26: BMS meeting at NHSM on Belair Rd. Video entitled "What's New in Minerals" presented by Jeff Scovil from the 2012 Rochester Mineral Symposium. 7:30 pm start with snacks provided by Jim Hooper.

August:

11 - 13: East Coast Gem, Mineral and Fossil Show, West Springfield, MA. I

18-20: Gem Miner's Jubilee, Lebanon, PA. Info: <www.gem-show.com/>

September:

5: Gem Cutters Guild meeting. Info and directions: <gemcuttersguild.com>

September:

23-24: Atlantic Coast Gem, Mineral, Jewelry & Fossil Show at the Howard Co. Fairgrounds. BMS will have an information booth - do plan to come and help.