Northwest Micro Mineral Study Group

# MICRO PROBE

FALL, 2006

FALL MEETING .................VANCOUVER, WASHINGTON

November 4, 2006

9:30 am to 5:00 pm

#### Clark County P. U. D. Building 1200 Fort Vancouver Way Vancouver, Washington

It is nice to be settled once again in the familiar Fort Vancouver facility. Bring your microscopes and something for the free table to share with others, as well as your special new finds and your unknowns to be identified. There should be ample time to enjoy looking at each other's special pieces, and swapping information about collecting.

MORNING: Ray Lasmanis will present "The Pine Point Mine, Northwest Terrritories, Canada".

AFTERNOON: Our usual very brief business meeting, to be followed by our update session to find out what localities are actively producing material and are good bets for collecting trips. Expect a brief report on our research projects.

If you have slides of mineral specimens or collecting localities that you would like to share, bring them along; we will have a projector and screen waiting.

The kitchen area is again available and we will plan on sharing lunch together, so bring something to add to the feast.

In the evening, many of us plan to go to a local buffet restaurant, so please join us if you can.





**VOLUME X, Number 4** 

#### The Bagdad Chase Mine, San Bernardino Co., California

by Don Howard

Following their annual Pacific Micro Conference in January, 2006, the Southern California Micromineralogists organized a field trip to two mines in the desert east of Redlands, California, and I was fortunate to be included in the group. The first stop was at the Bagdad Chase mine, where we spent an interesting day collecting. Since some of this material will be available on the give-away table at our Fall meeting, I thought it might be of interest to give an explanation of the mine, its minerals, and some of its history.

The Bagdad Chase mine is located a few miles south of the town of Ludlow, which was on the original Route 66. Now it is an exit off Interstate 40, nearly half way between the cities of Barstow and Needles. Route 66 was built in that area roughly parallel to the main line of the Santa Fe Railroad into southern California, and it was because of the railroad that the deposit was first noticed by a railroad employee searching for a source of water for the trains. He never found any water, but he did notice some copper stains and ended up staking some claims in the area when the assay proved to be rich in gold and copper. The claims were developed through the 1880s, and the claims and mines that were developed on them were sold in the early 1890s to a group of Eastern investors who promptly organized the Bagdad Mining and Milling Company.



Much of the money to be had in mining at that time came from buying and selling property, but sometime while all this haggling was taking place, some of the miners working the property discovered a large body of exceptionally rich ore. This lay in a horizontal breccia zone 8 to 15 feet thick between two intrusive layers of rhyodacite. The copper appears to have been mainly in the form of malachite with some chrysocolla. The gold was as well disseminated microparticles throughout the breccia. Some silver was also present, and there was considerable lead, though there does not appear to have ever been an effort to recover it. The breccia is believed to have been created due to extensive faulting in the area, and the mineralization to hydrothermal activity.

The original mining was done through shafts, approximately 400 feet deep, with several thousand feet of drifts and cross-cuts. Between 1903 and 1952, 400,000 tons of ore was produced, from which was recovered \$7 million in gold, silver, and copper. In the 1970s, the property was open pitted, but since that

time, though it has been leased several times, there has been little activity. The Bagdad Chase mine was the largest producer of both gold and copper in San Bernardino County over the years.

At one time, a spur railroad was built from the mine to Ludlow to deliver the ore to the main railroad for transportation to various smelters, in Barstow, California or in Clarksdale, Arizona. The equipment is long gone, but the grade makes up most of the gravel road that leads from Ludlow to the mine itself. In places, washouts have required that the road skirt around elsewhere, and there are rough places, so a 4-wheel drive is recommended, but in only a few miles you come across large piles of rock fragments. This is one area that we spent some time searching for goodies. But most of the time was spent working a small vein well up on a terrace at the back (south end) of the big pit. The vein was producing mainly lead minerals, and as you will see in the descriptions of the minerals that follow, most of the "collectables" are minerals containing lead.

The primary mineral available for collecting is **mimetite**. Most crystals are a very pale green color, though some have an orangish cast. They are short hexagonal prisms that may be several millimeters in diameter and about the same in length. Most of the crystals show two generations: a transparent core with sharp faces and a rough, opaque 'girdle'. The SEM shows a very similar composition for both regions, suggesting that the difference has more to do with growth rate than composition. Most crystals show a basal and prism faces, and a single set of pyramidal faces common to both regions (as in the illustration below). A few of the smaller crystals that lack the 'girdle' have a more complex array of faces.

One of the common associations of the mimetite was **wulfenite**. The crystal form is that of a very thin flat blade, square with a beveled edge. The crystals vary in size up to more than a centimeter across. Small ones are colorless and transparent, while larger blades tend to have a pale orange tint.

A second, less abundant associate of the mimetite is **cerussite** in the form of white opaque blades, often twinned into stellar sixlings. The blades do not have very sharp faces. They are generally standing on edge with the long axis parallel to the surface. Individual blades can be up to several millimeters in length, maybe a millimeter across, and perhaps a tenth of a millimeter thick.



Mimetite Bagdad Chase Mine, Ludlow, San Bernardino Co., California

Two views of the same crystal, approximately 2 mm in diameter. The view on the left is taken in the Scanning Electron Microscopy that is particularly sensitive to surface contour and detail. The view on the right is taken in a light microscope using a Paxcam microscope camera as 14 separate views combine using the program Helicon Focus. This brings out the interior details in the transparent central region of the crystal, through which the matrix below is visible.

An unusual find was **perite**, a lead bismuth oxychloride, as relatively large, well formed single crystal blades associated with clear mimetite and wulfenite. This was found in a single rock on the pile during a previous trip.

Another unusual mineral that has been found on the pile is **hedyphane**. This mineral is very similar to mimetite, but 40% of the lead sites in the crystal are occupied by calcium instead. Since this does not alter the crystal structure, the two minerals have the same overall symmetry.

Several of the rocks in the pile showed a light green surface of **duftite**, a copper lead arsenate. This bears a superficial resemblance to conichalcite, but under magnification shows numerous clusters of very complex crystal faces. The individual crystals in the clusters are quite small.

**Conichalcite** has been found near an old inclined shaft toward the back of the pit. It was associated with **barite**.

Although **malachite** appears to have been the primary copper mineral, few good specimens remain in the pit or on the rock pile. Most of the malachite was probably in massive form. There are blue patches of **chrysocolla** in places, but these are dried up and powdery for the most part. This does not seem to be a very profitable collecting place for copper minerals.

Some small clear colorless cubes of fluorite were found in a rock from the pile.

All the rock, both from the vein area and from the pile, is rusty in color due to the presence of considerable iron oxides. Therefore, **hematite** and **goethite** need to be included in the list of minerals.

#### References:

- 1. Polovina, J.S., Origin and Structural Evolution of Gold-Silver-Copper Bearing Hydrothermal Breccias in the Stedman Mining District, Southeastern California, Ariz. Geological Soc. Digest 15, 159-165 (1984).
- 2. Ross, D.G., The Bagdad Chase Mine, www.ttrr.org/ls\_text/lspb\_oo2.html.
- 3. The Bagdad Chase Mine, www.goldledge.com/history/docs\_html/metals\_san\_bernardino.html.

#### THE MICROPROBE

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#### A find of Titanite at Lemolo Lake Spillway, Douglas County, Oregon

#### By Kelly Starnes

I visited Lemolo Lake spillway in the month of July, 2006, while on a camping trip with my family at nearby Diamond Lake. The Micro-Probe report by Don Howard "Another Look At Lemolo Lake (Micro Probe, Volume 11, No. 9) had intrigued me, so I took the opportunity to collect at the spillway. Following Don's advice in his report, I primarily focused my collecting on those boulders that contained the bottom transition/contact zone of the andesite flow. One small boulder (about the size of a basketball) yielded titanite crystals, large (for the region) apatites, and very gemmy yellow, prismatic crystals of unknown composition (possibly magnesiohornblende). This report briefly describes my observations of the minerals that I have found in the collected material. The mineral identifications in this report are based upon crystal form, color, luster, and mineral associations.

**Titanite**  $CaTiSiO_5 - So$  far as I know, this is a new mineral to be reported from the spillway. It occurs as transparent, adamantine, pale honey-colored crystals. The crystals have a size range of approximately 0.5 mm or less. The dominant crystal forms are illustrated in Figure 1. The crystals are found within the transition zone within 1 to 2 centimeters above the contact. Associated minerals in the same cavity as the titanites are feldspar, tridymite, ilmenite, and unidentified transparent orange-brown crystals. Cavities adjacent to the titanite-bearing cavities have orange-yellow (very gemmy) unknown (magnesiohornblendes?), stout apatites, and ilmenite crystals.

**Zircon**  $ZrSiO_4$  – Very tiny (less than 0.2 mm), pink, tetragonal crystals (See Figure 1). The zircons were found in the more coarsely crystallized cavities within the transition zone. Associated minerals are feldspar, ilmenite, enstatite, and cristobalite.

**Apatite Group**  $Ca_5(PO_4)_3(OH,F,Cl)$  – Large, vitreous, transparent to milky white to pale greenish white, prismatic hexagonal crystals (See Figure 1). The crystals range from sub-0.2 mm to 0.8 mm in length and are up to 0.5 mm in width. These are much stouter crystals than the average transparent needle-like crystals found at the spillway and elsewhere in the region. The stout apatites are found on the border between the contact and transition zone, whereas the needle-like appear mostly to be in the transition zone and possibly the flow interior. Mineral associations with the stout apatites in the same cavity are yellow crystalline masses (see below) and ilmenite. Titanite was found in adjacent cavities in the transition zone.

**Unknown #1 (possibly Magnesiohornblende?)** – Transparent, fine pale brown to pale yellow needles to large orange-yellow (very "gemmy") prisms up to 0.8 mm in length. The prisms exhibit a six-sided cross-section with a nearly flat termination (see Figure 2). I believe the crystal form distinguishes the yellow crystals from aegirine, which form more acute terminations. The associated minerals (titanite and apatite) indicate a calcium rich environment, which would lean the identification in favor of magnesiohornblende. The pale brown to pale yellow, fine needle-like and more prismatic crystals were found along the flow interior/transition contact. The orange-yellow crystals are located in the transition zone nearer the boundary with the contact zone. Opaque prisms were found within the contact zone. Associated minerals within the same cavity are ilmenite and small feldspars.

Also, yellow crystalline masses were observed in the transition/contact zone forming rough radiating sprays and curved, intertwining filaments that appear to be composed of minute crystals. These may be magnesiohornblende? or aegirine, just based upon their color.

**Ilmenite**  $(Fe^{2+}TiO_3)$  – Well-formed, up to 0.8 mm, black, crystals. The largest and most lustrous crystals were found in the transition zone. A variety of crystal forms are found ranging from hexagonal plates to pseudo-octahedral and pseudo-cubic forms. The ilmenites are distinguished from magnetite by their relatively low magnetism. Some ilmenite crystals found in the transition zone have a bright bronze patina.

**Pseudobrookite**  $(Fe^{3+}, Fe^{2+})_2(Ti, Fe^{2+})O_5$  – Thin to thick bladed, 0.01 to 0.5 mm, sub-metallic, black to dark red, crystals were found throughout the transition zone. This mineral seems to be absent in the area of the cavities containing the titanite. Several specimens from the contact zone have crystals that appear to have the form of pseudobrookite, but are semi-transparent and bright red, without a submetallic luster, possibly altered pseudobrookite?

**Magnetite**  $Fe^{2+}Fe^{3+}{}_{2}O_{4} - A$  single rounded crystal-form coated with a black mineral was found to be highly magnetic. Possibly ilmenite coated with magnetite.

**Phlogopite**  $KMg_3(Si_3Al)O_{10}(F,OH)_2$  – Pale pink to colorless, platy hexagonal crystal groups and singles. Found in the flow interior/transition zone boundary. Associated minerals are enstatite, pseudobrookite, ilmenite, cristobalite, tridymite, and feldspar.

**Enstatite**  $Mg_2Si_2O_6$  – Pale to root beer brown, blades to prisms, up to 1.0 mm, were found to be fairly common in the flow interior, but less common in the transition zone. The larger crystals tended to be more prismatic in form.

**Tridymite, Cristobalite**  $SiO_2$  – Milky white (cristobalite) to transparent (tridymite), single and twinned crystals were observed from the flow interior to the transition/contact zone.

Unknown #2 - Dark brown to orange brown, elongated tabular crystals, were found to be in the same cavities as the titanites.

Unknown #3 – Blue-green to green blebs, 0.5 mm or less, in a cavity within the contact zone. The blebs are most likely a possible copper silicate or a copper carbonate.

#### **Bibliography**

Ford, William E. (1932), A Textbook of Mineralogy by Edward S. Dana (4th Edition), John Wiley and Sons, New York

Howard, Don G., (2004), Another look at Lemolo Lake; Micro Probe, Vol. IX, No. 9, pages 3-4.

Howard, Don G., (2004), Further Update on the Minerals of Summit Rock, Klamath County, Oregon: Magnesiohornblende, Phlogopite, and Cristobalite; Micro Probe, Vol. IX, No. 9, pages 5-6.





#### A System for Precise Control of the Microscope to take Multifocus Exposures for Composite Digital Photographs

Francois Perinet from Le Cahier des Micromonteurs #92 – 2-2006 – page 18. (Loosely translated from the French by Don Howard)

In order to use a system of multiple images, such as with the program COMBINE, it is necessary to take a series of pictures at different focal plane levels. This task can be accomplished, for example, by varying the position of the microscope body with respect to the sample with the aid of the control knob. The manner of operation is quite delicate, since very little rotary movement of the knob is required, and the motion must be repeated reproducibly. The required shift of the focal plane is only a few hundredths of a millimeter for each photograph.

Given here is a solution for the precise control of the microscope body. The microscope system described is a EUROMEX MIC 1532 with a NIKON COOLPIX 4500 mounted on the ocular. In principle, the point of action is moved as far as possible from the axis of the adjustment knob (in the illustration below, the lever arm is 100 mm long).



For the microscope body, one rotation of the adjustment knob translates into a movement of the assembly vertically of 28 mm. For 1 degree of rotation, therefore, the focal plane will move 0.077 mm. Proper control of the displacement to a few hundredths of a millimeter thus requires a maximum rotation of around  $\frac{1}{2}$  degree (0.038 mm displacement of the focal plane).

The calculated displacement necessary at the end of the 100 mm lever arm to produce  $\frac{1}{2}$  degree of rotation is  $100*\tan(1/2) = 0.872$  mm. A displacement of this order of magnitude can easily be produced using the rotation of a screw. For a screw of 6 mm diameter and thread pitch of 1 mm, one turn would move the focal plane up 0.043 mm. Thus, one quarter turn would give a shift of 0.01 mm to the focal plane.

Such a device is illustrated in the pictures below:

Detailed views of the fixed plate (left) and of the split ring with the rod forming the lever arm in place.





View of the complete assembly in place and ready to use.

For the fixed point: an aluminum plate is fastened securely to the microscope base.

For the mobile part: a split aluminum ring is adjusted in diameter to just slip over the height adjustment knob of the microscope. A set screw holds it firmly in place. A threaded rod provides the lever arm. Hex nuts can be adjusted to make a firm contact point with the adjustment screw mounted through the fixed plate.

In practice, for the first photo of a series, the focal plane is chosen at the lowest level. The aluminum splitring is firmly tightened about the raising knob. The adjustment screw is brought into contact with the lever arm and tightened until the focal plane is barely raised, and the first photo is successfully taken. Now the adjustment screw is advanced in successive stages and a series of photos are taken until the highest level desired for the focal plane is reached. Play in the raising mechanism is not a problem, since the adjustment screw keeps the proper tension to give precise movement.

#### **TRANSLATOR'S NOTES:**

I have found that with the Russian microscope I am using, one full turn of the raising knob only corresponds to about 18mm of vertical travel. Thus, 0.1 mm corresponds to about 2° of rotation, an amount I can generate pretty well without the need for a lever like this. Moreover, the program I am using (Helicon Focus) does not require exactly even steps in the series of pictures. Every microscope travel is different, however, so I have included this article as something to consider if your rate of travel is excessive, or if the adjustment by hand is not very smooth. Being able to take a set of shots by using the vertical raising knob is certainly a lot cheaper than the alternative of finding and buying an adjustable microscope stage with motion in all three dimensions.

Helicon focus also has the feature of correcting for offset sideways in successive photos in a set. And I have found using it that 0.1 mm seems to be about right between photos to still get a smooth result. The right-hand photo of mimetite on page 3 is an example, where a series of 14 exposures was sufficient to produce a pretty good image of a crystal that stands nearly 1 mm high. Similarly, the picture of chiavennite on page 12 is a composite of 11 pictures. In this case, another series with 21 pictures did not seem to produce better detail.

As the article indicates, it is preferred to take the set of pictures from the bottom, raising the microscope, as this keeps gravity working for you to prevent sticking and jerking. In any case, it is important that the lifting mechanism is properly adjusted and lubricated for smooth, steady motion.

As the comparison of pictures of mimetite shows, the use of a set of pictures and a composite program like Helicon Focus will allow light microscope pictures with comparable detail but a different emphasis to those taken with the SEM. And these pictures (at least the originals before zeroxing) are in color!

Update of Zeolite Species

#### Donald G. Howard

In this issue, we add five minerals that contain beryllium to the zeolite family. These were included because the beryllium is in tetrahedral coordination in the same way that silicon and aluminum are in zeolite structures. The fact that IMA included such compounds when they reorganized the zeolite group in 1998 therefore makes a lot of sense. The compounds form identical three-dimensional space lattices with loosely held positive ions to neutral charge.

Four of the minerals are beryllium silicates. The fifth, roggianite, also contains aluminum. When first analyzed and published, the small beryllium content was overlooked, and was only found on reexamination after the proposed mineral ginzbergite was put forward. The beryllium tetrahedral proved to be an integral part of the space network.

Because of the beryllium content, these minerals are rather unusual and rare, since they require a rather specific environment that is not present in most zeolite environments. But they certainly are no rarer than the zeolites with heavy metal content that were featured in the last issue. Several of these minerals are indeed available from time to time and could very well be an addition to your zeolite collection.

# Chiavennite

Ca Mn (BeOH)<sub>2</sub> Si<sub>5</sub> O<sub>13</sub> · 2 H<sub>2</sub>O, Z = 4

Named in 1983 by Mirella Bondi et. al. for the type locality.

Type locality: Chiavenna, Sondrio, Lombardy, Italy

#### Structure

Crystal System: Orthorhombic Space Group: Pnab Crystal axes: a=8.729 A b=31.326 A c=4.903 A

**Type of Structure**: Asymmetric 9-membered rings alternate with 4- and 5-membered rings to form a framework with onedimensional channels parallel to [001]. The manganese atoms in 6-fold coordination lie in planes perpendicular to the b axis. The calcium and water molecules occupy positions within the 9-membered rings.

#### **Physical Properties**

#### **Optical Properties**

Color: pale orange-yellow to reddish orange Streak: white to pale ocher Luster: vitreous to pearly Hardness: 3 Density: 2.64 g/cm<sup>3</sup> Fracture: Cleavage: good to perfect along {100}, {010} & {001} Twinning: none observed Fluorescence: none observed Refractive Index:  $\alpha = 1.596$   $\beta = 1.600$   $\gamma = 1.618$ biaxial positive  $2V = 50^{\circ}$ 

#### Morphology

Aggregates of spear-shaped crystals up to 2mm across and 10  $\mu$ m thick, flattened on {010} and elongated along [100]. Also as minute pseudohexagonal platelets. **Forms**: Dominant forms are {010} and {161}.

#### **Chemical Composition**

Italy: ( $Ca_{0.97} Na_{0.05}$ )  $Mn_{0.97}$  ( $Be_{1.98} Al_{0.03}$ ) ( $Si_{4.65} Al_{0.35}$ )  $O_{12.63}$  (OH)<sub>2.37</sub> · 1.83 H<sub>2</sub>O Norway: ( $Ca_{0.92} Na_{0.12}$ ) ( $Mn_{0.80} Fe_{0.15} Mg_{0.02}$ ) ( $Be_{1.86} Al_{0.14}$ ) ( $Si_{4.43} Al_{0.57}$ )  $O_{12.45}$  (OH)<sub>2.49</sub>  $F_{0.06}$  · 2.16 H<sub>2</sub>O

#### Occurrence

In pegmatites associated with a wide variety of other minerals.

#### Italy

Found in pegmatites in the Valle di San Giacomo near the town of Chiavenna, Sondrio, Lombardy, as crusts coating beryl and usually accompanied by bavenite. Other minerals present include albite, microcline, quartz, zircon, tourmaline, arsenopyrite, bisbuthinite, gahnite, pyrite, pyrochlore, titanite, uraninite, aeschynite, and laumontite. Crystals up to 0.4 mm have been observed.



#### Madagascar

Orange-brown crystals up to 3mm, associated with pezzottaite and hambergite, were found at the Sakavalana mine, Ambatovita, Ampandramaika-Malakialina Pegmatite Field, Fianarantsoa Province.

#### Norway

Occurs at several sites in the syenite pegmatite of the Oslo Region:

Originally found at the Heia larvikite quarry, Tvedalen, 10 km west of Larvik, in pegmatite sheets 10-50 cm thick, as one of the last minerals to crystallize, forming spherulites on analcime and natrolite. Where the chiavennite occurs, the K-feldspar is somewhat altered and nepheline is absent. Other minerals present in these pegmatite layers include albite, biotite, aegirine, zircon, thorite, thomsonite, chlorite, hambergite, arsenopyrite, lollingite, galena, apatite, fluorite, wulfenite, wickmanite, leadhillite & hydrocerussite.

In a road cut at Blafjell, Langangen, 8 km NW of Tvedalen, where it occurs as druses in a restricted part of an irregular pegmatite as the last mineral of the sequence analcime, aegirine, helvite, eudidymite, natrolite, chiavennite. Also found along cracks in K-feldspar and analcime.

At Bakkane, Brunlanes, along route 302, about 3 km SW of Larvik, in a syenite pegmatite associated with epididymite, growing as druses on analcime and natrolite.

At Vevja (Bakken), a larvikite quarry in the Tvedalen district, as small spherules on analcime crystals.

#### Sweden

Occurs as crystals and aggregates up to 5mm, associated with genthelvite, helvite, milarite, bavenite, manganite, wickmanite and friedelite have been found at Sodermanland, Uto, Grundberg Pegmatite, Nykopingsgruvan.

#### **References**:

- 1. Bondi, M., Griffin, W.L., Mattioli, V. & Mottana, A., *Chiavennite, Ca Mn Be*<sub>2</sub>*Si*<sub>5</sub>*O*<sub>13</sub>(*OH*)<sub>2</sub> 2 *H*<sub>2</sub>*O*, *a new mineral from Chiavenna (Italy)*, **Am. Min. 68**, pg 623-627, (1983).
- Raade, G., Amli, R., Mladeck, M.H., Din, V.K., Larsen, A.O. & Asheim, A., Chiavennite from syenite pegmatites in the Oslo Region, Norway, Am. Min. 68, pg 628-633, (1983).
- 3. Tazzoli, V., Domeneghetti, M.C., Mazzi, F., & Cannillo, E., The crystal structure of Chiavennite, Eur. J. Min. 7, pg1339-1344, (1995).
- 4. Langhof, J. et al, Geologiska Foreningens i Stockholm, Forhandlingar 122, 207-212 (2000).
- 5. Pezzota, F., lapis 5/2005, 26-30 (2005).



Chiavennite – clusters of pseudohexagonal platelets on analcime. (x50) Vevja Quarry, Tvedalen, Vestfold, Norway

# Hsianghualite

 $Ca_3 \ Li_2 \ (Be_3 \ Si_3 \ O_{12}) \ F_2 \, , \ \ Z=8$ 

Named in 1958 by Wen-Hui Huang et al for the place of discovery, which in Chinese means "fragarent flower".

Type locality: Xianghualing, Linwu, Chenzhou Prefecture, Hunan Province, China.

#### Structure

Crystal System: Cubic Space Group: I4<sub>2</sub>32 Crystal axes: a=12.897 A Type of Structure: An analcime-type structure with tetrahedral sites occupied alternately by Si and Be.

#### **Physical Properties**

#### **Optical Properties**

n = 1.613

**Refractive Index:** 

**Color:** colorless to white **Streak:** white **Luster:** vitreous, glassy **Hardness:** 6.5 **Density:** 2.97 to 3.00 g/cm<sup>3</sup> **Fracture:** brittle **Cleavage:** none

#### Morphology

Occurs as dodecahedral and trapezohedral crystals up to 17mm across. **Forms:** 

#### **Chemical Composition**

Two analyses given:

 $\begin{array}{l} (Ca_{3.03}\ Mg_{0.02})\ (Li_{1.92}\ Na_{0.02})\ (Be_{3.09}\ Si_{2.91}\ Al_{0.05}\ O_{12})\ F_{2.01} \\ (Ca_{3.03}\ Mg_{0.02})\ Li_{1.81}\ (Be_{3.14}\ Si_{2.94}\ O_{12})\ F_{1.85} \\ \text{Minor amounts of iron and potassium were also reported.} \end{array}$ 

#### Occurrence

The mineral occurs in phlogopite veins in the light-colored band of green and white banded, fluorine-rich, metamorphosed Devonian limestone that was intruded by beryllium-bearing granite.

#### China

In a now-closed mine near Xianghualing, Linwu, Chenzhou Prefecture, Hunan Province, as white granular material and crystals embedded in a dark green chlorite-like schist. Associated minerals include fluorite, zinnwaldite, chrysoberyl, taafferite and liberite.

#### **References**:

- 6. (Abstract) Am. Min. 44, pg 1327.
- 7. (Abstract) Am. Min. 46, pg 244.

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## Lovdarite

K4 Na12 (Be8 Si28 O72) · 18 H2O

Named in 1972 by Yu. P. Men'shikov for the type locality.

Type locality: Mount Karnasurt in the Lovozero pluton, Russia.

#### Structure

Crystal System: Orthorhombic Space Group: Pma2 Crystal axes: a=39.576 A (79.16 A) b=6.9308 A c=7.1526 A

Type of Structure: Two types of structure were recognized, a primitive cell (a=39.58 A) and a body-centered cell (a=79.16 A). In the bc plane, there are 8-membered and 4-membered rings in a layer, with the next layer displaced diagonally. This is then duplicated through reflection and rotation several times. The result leads to 3-membered rings in the ac plane that are stabilized by replacing one Si with a Be. Several complex orderings can result, leading to a variety of closely related structures which may be intergrown.

#### **Physical Properties**

**Optical Properties** 

 $\beta = 1.516$ 

Color: white to yellow, crystals colorless	<b>Refractive Index</b> :
Streak:	$\alpha = 1.513$
Luster: vitreous	$\beta = 1.516$
Hardness: 5-6	$\gamma = 1.518$
<b>Density</b> : 2.33 g/cm <sup>3</sup>	biaxial positive
Fracture: irregular, splintery	$2V = 90^{\circ}$
<b>Cleavage</b> : distinct along (100), (010) & (001)	
Weak along (110)	

#### Morphology

Prisms up to 2mm in length.

#### **Chemical Composition**

(Na13.76 K3.80 Ca0.25 Mg0.04) (Be7.87 Al0.99 Ti0.11 P0.02 O72.) · 19.5 H2O

#### Occurrence

As an alteration product of chkalovite in a layer between fayalite (top) and lujavrite (bottom). Aggregates of lovdarite are compact and porcelaneous or have a fibrous-radial texture. Some colorless, prismatic crystals are present on the walls of small sporadic cavities in the compact lovdarite and chkalovite.

#### Greenland

Occurs at Ilimaussaq, Kvanefjeld in aggregates of crystals to 0,2mm associated with nabesite, gmelinite-Na, analcime and gonnardite.

#### Russia

Found in the Yubileynaya stratiform pegmatoid deposit of the third eruptive phase of alkalic intrusion on Mount Karnasurt in the Lovozero pluton as massive rims 1 to 2 cm wide coating chkalovite grains and crystals which in turn are embedded in natrolite.

#### **United States**

**New Mexico:** Lovdarite has been reported from Point of Rocks (Peck's Mesa) near Springer, Raton Region, Colfax County, associated with analcime, cancrinite, chabazite, and natrolite.

#### **References**:

- 8. Men'shikov,Yu.P., Denisov,A.P., Uspenskaya,Ye.I., & Lipatove,E.A., *Lovdarite, a New Hydrous Alkali-Beryllium Silicate*, **Doklady Akad. Nauk** SSSR 213, 130-133 (1973).
- 9. Merlino, S., Lovdarite, K<sub>4</sub> Na<sub>12</sub> (Be<sub>8</sub> Si<sub>28</sub> O<sub>72</sub>) · 18 H<sub>2</sub>O, a Zeolite-like Mineral: Structural Features and OD Character, Eur. J. Mineral. 2, 809-817 (1990).
- 10. Northrup, S.A. & LaBruzza, F.A., Minerals of New Mexico, pg 38, 72, 76, 146 (1996).
- 11. Petersen, O.V. et al, Neues Jahrbuch fur Mineralogie, Monatshefte 21, 23-30 (2002).

# Roggianite

 $Ca_2$  (Be (OH)<sub>2</sub> Al<sub>2</sub> Si<sub>4</sub> O<sub>13</sub>) · <2.5 H<sub>2</sub>O, Z = 8

Named in 1969 by E. Passaglia for Aldo G. Roggiana, a teacher of natural sciences who first found the mineral.

Type locality: Alpe Rosso in Val Vigezzo, about 1.5 km south of Orcesco, commune of Drugno, Novara, Italy

Obsolete Synonyms: ginzburgite

#### Structure

Crystal System: Tetragonal Space Group: I4/mcm Crystal axes: a=18.33 A c=9.16 A

**Type of Structure:** 12-membered rings form channels along [001]. These alternate with 4-membered rings also forming channels along [001]. The Ca ions and the tetrahedral containing the Be are in the walls between the channels. The Si and Al appear to be in ordered positions. The water molecules occupy positions within the larger channels.

#### **Physical Properties**

#### **Optical Properties**

uniaxial positive and negative

**Refractive Index:** 

elongation along c

Color: whitish yellow to colorless
Streak: white
Luster:
Hardness:
<b>Density</b> : 2.12 g/cm <sup>3</sup> (?)
Fracture:
Cleavage: {100} perfect
Twinning:

#### Morphology

Aggregates of fibers elongated along [001]; minute tabular prisms (~50  $\mu$ m) perpendicular to [001]. **Forms**: Dominant forms are {100}, {110}, and {010}.

#### **Chemical Composition**

For ginzburgite:  $(Ca_{3.63} Na_{0.11} K_{0.03})$  (Be<sub>1.81</sub> Al<sub>3.85</sub> Si<sub>7.15</sub> O<sub>23.29</sub> (OH)<sub>4.60</sub> · 3.08 H<sub>2</sub>O The several analyses of roggianite given all omit the presence of Be, which was detected in the structural study. Minor amounts of iron, magnesium, barium, sodium, potassium and sulfate reported.

#### Occurrence

Fracture coatings in feldspar dikes.

#### Italy

Originally found in a sodium feldspar dike cutting across the gneiss at Alpe Rosso in Val Vigesso, about 1.5 km south of Orcesco, commune of Druogno, Novara. The dike was quarried at one time and brought to Orcesco by cableway, where material was piles near the discharge station.

A second occurrence was found in an albitite dike about 1 km away at Pizzo Marcio.

#### Russia

A similar mineral, originally named ginzburgite, was reported from desilicated pegmatites of the Murzinsk region in the Ural Mountains. It occurs as acicular crystals with complex to square cross-section up to 0.02mm across, arranged in subparallel, radiating, and spherulitic clusters up to 2cm in diameter, associated with bavenite, bityite, behoite, analcime, phillipsite and albite.

#### **References**:

- 12. Passaglia, E., Roggianite, a new silicate mineral, Clay Minerals 8, pg 107-111 (1969).
- 13. Vezzalini, G. & Mattioli, V., Secundo Ritrovamento della roggianite, Periodico di Mineralogia 48, pg 15-20 (1979).
- 14. (Abstract) Am. Min. 73, pg 439-440 (1988).
- Giuseppetti, G., Mazzi, F., Tadini, C. & Galli, E., *The revised structure of roggianite Ca*<sub>2</sub> (*Be (OH)*<sub>2</sub> *Al*<sub>2</sub> *Si*<sub>4</sub> *O*<sub>13</sub>) <2.5 *H*<sub>2</sub>*O*, N. Jb. Miner. Mh. Pg 307-314 (1991).

### Tvedalite

 $(Ca, Mn)_4 Be_3 Si_6 O_{17} (OH)_4 3 H_2O, Z = 2$ 

Named in 1992 by Alf Olaf Larsen et. al. for the type locality.

Type locality: Vevja quarry, Tvedalen, Brunlanes, Vestfold, Norway

#### Structure

Crystal System: Orthorhombic Space Group: Crystal axes: a=8.724 A b=23.14 A c=4.923 A Type of Structure: not yet determined

#### **Physical Properties**

#### **Optical Properties**

n = 1.604

**Refractive Index:** 

Color: white to pale gray or beige Streak: white Luster: vitreous Hardness: 4.5 Density: 2.54 g/cm<sup>3</sup> Fracture: Cleavage: perfect along {010} Twinning: not known Fluorescence: none observed

#### Morphology

Spherules up to 3 mm in diameter, composed of densely packed, radially oriented platelets, each only a few micrometers in length. The spherules show concentric zoning, and have an overgrowth of chiavennite microcrystals.

#### **Chemical Composition**

 $\begin{array}{l}(Ca_{2.52}\ Mn_{1.25}\ Fe_{0.12})\ Be_{3.00}\ (Si_{5.74}\ Be_{0.27}\ Al_{0.10})\ O_{17}\ (OH)_4\ \ 3.06\ H_2O\\ The\ Ca\ and\ Mn\ ratio\ varies\ across\ the\ sample\ from\ Ca_{3.20}\ Mn_{0.72}\ Fe_{0.08}\ to\ Ca_{2.00}\ Mn_{1.86}\ Fe_{0.14}\end{array}$ 

#### Occurrence

In hydrothermally altered, heavily zeolitized syenite pegmatite associated with chiavennite. Together with analcime and natrolite, they are the last minerals tocrystallize.

#### Norway

At Vevja (Bakken), a larvikite quarry in the Tvedalen district, from blasted rock fragments on the floor. Other minerals in the same rock include microcline, aegirine, biotite, nepheline (completely altered to zeolites), magnetite, pyrochlore, zircon, sphalerite, arsenopyrite, pyrite, molybdenite, fluorite, todorokite, calcite, parasite-(Ce), thorite, leucophanite, chlorite, epididymite, chiavennite, analcime & natrolite.

#### **References**:

 Larsen, A.O., Asheim, A., Raade, G. & Tafto, J., Tvedalite, (Ca, Mn)<sub>4</sub> Be<sub>3</sub> Si<sub>6</sub> O<sub>17</sub> (OH)<sub>4</sub> 3 H<sub>2</sub>O, a new mineral from syenite pegmatite in the Oslo Region, Norway, Am. Min. 77, pg 438-443, (1992).

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# Atlas der Krystallformen

Victor Goldschmidt's Atlas der Krystallformen is now available on DVD from <u>www.mindat.org</u>. The cost is \$42.00 to the United States including shipping. This is a great opportunity to get this work. An original would be far too expensive for most of us. The reprint done by the Rochester Academy of Science is difficult to find.

The DVD is scanned from the reprint and is a high quality reproduction. It is much better than the CD that has been available for several years and the web versions available. Below is an enlargement of one of the crystal drawings.

# Adamin Fig. 1.

The next two pages are full page copies of crystal drawings and the data page for part of the page.



Goldschmidt, Atlas d. Kristallformen. Bd. r.

# Adamin.

#### Rhombisch.

 $p_0q_0 = 0.7354; 0.7158.$ 

a:b:c = 0.9733:1:0.7158.

1

I

No.	Laspeyres 1878 Gdt. 1897 Winkeltab.	Symbol	Aloisi 1909	Descloizeaux 1874 Schulten 1903 Lacroix 1910	Dana 1892	Rosický 1908	Gdt. Index 1886
I	c	0	001	Р	с	c	0 00
2	b	000	010	g¹	Ь	ь	0 00
3	a	∞0	100	h1	2	-	0
4	k	400	410	h <del>i</del>	k	k	01
5	m	2 00	210	h³	h	m	0 +
6	n	3∞	530	h4	n	n	03
7	r	30	011	m	nı	r	0 1
8	S	ωţ	350	g*	s	5	0 3
9	t	œ 2	120	g³	t	t	0 2
10	1	10	OII	e1	1	1	80
II	h	÷0	103	-	_	f	-
12	e	30	205	-		e	-
13	f	÷0	506	a <del>3</del>	ſ	_	€ o
14	g	\$0	607	a 7	_		_
15	d	10	101	a <sup>1</sup>	d	d	IO
16	0	I	1,11	bź	0	0	I
17	i	I 2	121	e,		-	_
18	р	± 3	123	-	_		-

#### Korrektur.

Aloisi, Rivista 1909. 39 Seite 61 Zeile 9 v. u. lies: (120) statt (820).

Taf.	Fig.	Fundort	Citate		
I	I	Chanarcillo (Chile)	Descloizeaux, Manuel 1874. Taf. 72 Fig. 438.		
-	2	Cap Garonne bei Toulon	» » » » » 439; Lacroix, Min. France 1910. 6. 426 Fig. 1.		
	3	Laurion (Griechenland)	Laspeyres, Zeitschr. Kryst. 1878. 2 Taf. 6 Fig. 1; Dana, Syst. 1892. 787.		
	4	» n	»» »» »» »» »» »» »» <b>2.</b>		
	5	Künstlich	Schulten, Bull. Soc. Franç. 190326. 94.		
	6	Mte Valerio (Toscana)	Aloisi, Proc. Verb. Soc. Tosc. 1907; Rivista 1909. 39. 59.		
	7	Thasos (Tūrkei)	Rosický, Abh. Bohm. Ges. Wiss. 1908. 17 Taf. Fig. 1.		
	8	» »	» » » » » » » » » » <b>2.</b>		
	9	Mine d. l. Garonne b. Hyères	Lacroix, Min. France 1910. 4. 426 Fig. 2.		
	10	Ain Achour (Constantine)	v » » » 427 » 4.		

Goldschmidt, Atlas d. Krystallformen. Text. Bd. 1.