

Painite Update

PAINITE
A story from
AIGS Lab (Bangkok, Thailand)
in collaboration with
New Aurora Gem lab (Mogok, Burma)

Followed by

Part 1: A rare gem from Burma (Myanmar):

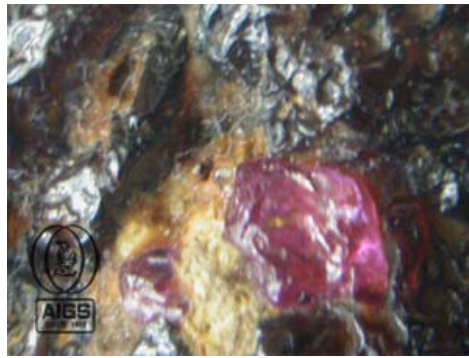
The first time I heard about painite was when I was a gemology student in Yangon, Burma. My Burmese teachers were then very proud to tell me about the rarest of all gemstone for which only 3 pieces were known. This stone was from Mogok in upper Burma where many other rare and beautiful gems are found.

The first time I was able to see a painite was when I visited a very knowledgeable friend in Mogok in July 2004 with my friend Ngwe Lin Htun also known as "FGA Ko Pauk" in Mogok. Ko Pauk, is the owner of the New Aurora Gem lab in Mogok and a very capable gemologist who identified most of the painites in Mogok, thanks to the help of Professor [George Rossman](#), a mineralogy professor at Caltech university, USA which has done an extensive work on painite studying and listing all the known specimens for years, and my old friends [Bill Larson](#) an American Gem dealer and Docteur Saw Naung U from Mogok. This painite crystal was referenced as painite number 4 from [Prof Rossman's list](#). I could study it shortly on site and see some small ruby crystals at the back of this large specimen:



("New Aurora" Gem Lab manager Ngwe Lin Htun also known as "FGA Ko Pauk" and AIGS Laboratory Executive Director Vincent Pardieu with [Painite No 4 \(Dr. Rossman classification\)](#) in Mogok, July 2004)





[Painite crystal number 4](#) and details on the 2 ruby crystals visible at the back of the stone.

In December 2004 a painite crystal came for identification for the first time at AIGS lab, the stone was a dark crystal with a polished termination weighting 1.8 carats. It was told us to be from Onhgaing mining area in central Mogok, Burma which is the traditional locality for painite. The stone was reported to have been taken to Japan where it was sold. This stone is currently referenced by [Prof. Rossman as painite number 9 in his painite study](#):



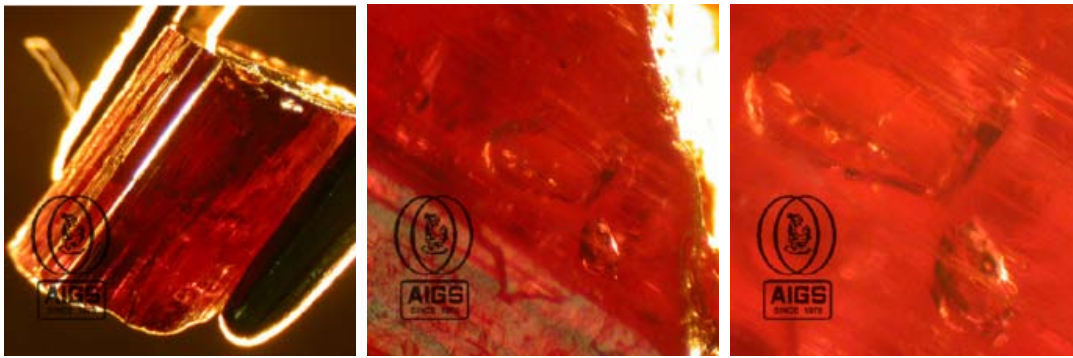
(Three different views of [painite number 9](#), while it was at AIGS lab, Bangkok in December 2004)

Three other painites were studied and identified at the AIGS laboratory, Bangkok, Thailand in Jan 2005: A dark red crystal first from Onhgaing, Mogok and then 2 pink stones (one rough, one cut weighting respectively 0.13 and 0.09 carats) from Namya also in Burma in which painite was discovered for the first time outside Mogok. This was for me very interesting as it was the first time I was able to see a cut painite and the small attractive light pink cut stone I had in my hands was very different compared to the black crystals I've seen previously from Mogok... I could see with this stone some serious possibilities for some beautiful cut stones to appear!

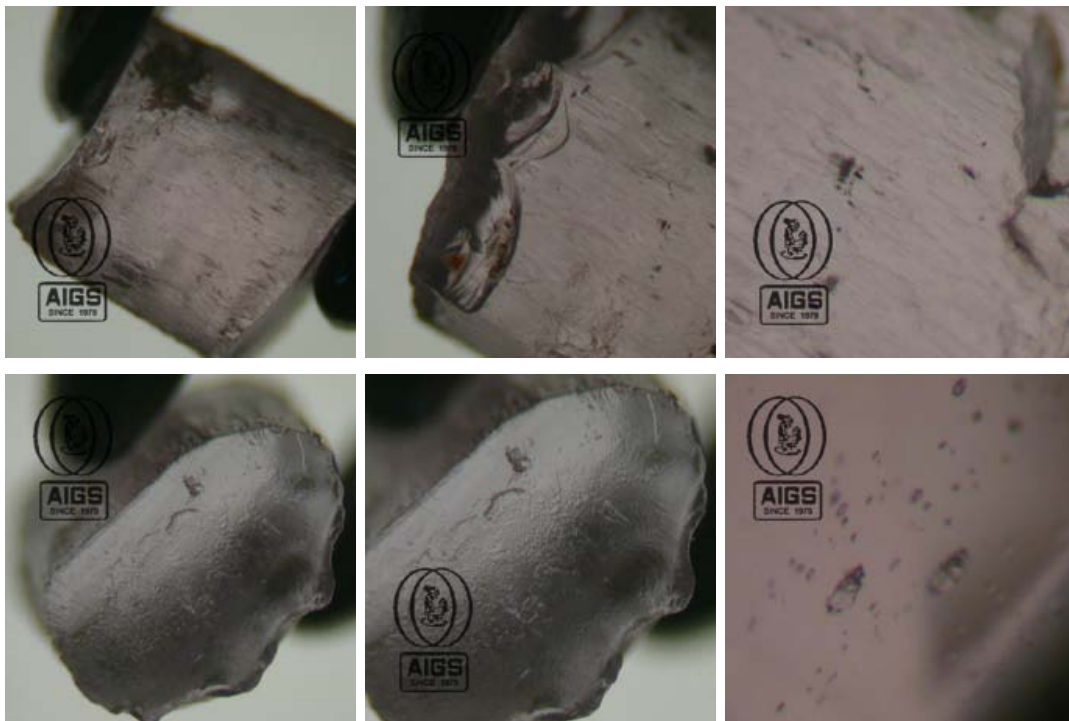
That was some serious gemological news... at least for me as it seems that Prof. Rossman was aware of this new painite source for several years as I was told later. He had made a trip to Namya in March 2002 and brought back from the area some samples. Studying these stones he found [painites number 6 and 7](#). Nevertheless his discovery was known only by few people for a long time but slowly the news spread out and a Burmese gemologist: Kyaw Khine Win went to Namya in November 2004 found also some painites which was announced in March 2005 [by the Burmese press](#).

It was the reason I started working on this present study with gemologist Ko Pauk from Mogok, Burma (Myanmar). Soon after I had to turn my focus on a long ruby and sapphire [field trip around Asia and Africa](#), so this painite study had to wait...





(Several views of [painite_number_17](#), with some details of its interesting negative crystal inclusions)



(Details on the surface of the Namya rough painite and an inclusion photo presenting what looks to be some 2 phase liquid inclusions present in the small cut stone)

Up to June 2005 painite was an extremely rare gem and mineral. But a recent discovery in the west of Mogok near the famous [Kyauk Pya That monastery](#) made this stone much more available than ever before as I could read on [Bill Larson Painite story on palagems.com](#) when I was running Kenya and Tanzania on a long ruby and sapphire fieldtrip.

Several thousands of painite crystals were believed to have been found in several mines around the monastery including from the famous [Thurein Thaug mine](#) which is famous for its high quality blue sapphires and is one of the extremely rare mines where fine quality rubies and top quality blue sapphires could be found.



(The author posing in front of [Thurein Thaug mine](#), Mogok, Burma with Dr Saw Naung U and AIGS instructor Jayesh Patel from a view point in Kyauk Pya That monastery, July 2002)

Painite is currently at least as a mineral specimen much less rare than in the past and after this discovery Prof Rossman decided to stop listing individually all the known painites, but focuses now on the most interesting and noticeable specimens.

Nevertheless fine cuttable material and clean crystals are still said to be extremely difficult to get even in this time of relative abundance in Burma. Currently Burmese dealers are all excited about the new discovery and lower quality painite crystals can be found without too much difficulties in Yangon. But to find gem quality is still a very serious challenge for experienced dealers familiar with painite.

From September 20th to November, 17th 2005 as a result, 16 small cut painites from 0.09 to 0.38 were brought for examination to the AIGS lab. This was a good reason for me to work again on this painite study...



(Some of the faceted cut painites bring for examination at AIGS lab, "daylight" fluorescent illumination.
Stones courtesy: Scott Davies, [American-Thai Trading](#))

A major input happened on November 15th while I was taking a coffee in my favorite area near JTC Tower after having lunch: A former AIGS student of Burmese origin came to me and proposed me to study the large painite parcel in his possession. I was amazed to see a few minutes later on my working table 40 small plastic bags containing around 700 painite crystals, specimens in matrix and also 2 cut stones!



(The 700 painite specimens in their 40 plastic bags as I saw them on my working table... Amazing!)

It was a very interesting parcel for gem crystals lovers like me: The largest crystal was 71 carats and the largest of the two cut stones was a cleverly cut 2.02 carats dark red stone. Several interesting specimens in matrix were also present and I could see many tiny painite crystals associated with small rubies on the same matrix (see photos).

These few days from November 15th to November 18th 2005 in Bangkok were really "painite days" at AIGS lab as I was able to see , besides from my former brumese student, painites from 3 other gem dealers coming back from Burma:

William Larson from palagems.com was one of them. He has the best facetable Mogok painite material I have ever seen, as well as a fine specimen where small rubies were associated with painite crystals.

The second, from gemwow.com, had also some great but smaller pieces where painite crystals were associated with rubies.

and the third: Scott Davies from American-Thai-Trading was focussing on selected crystals to produce small cut gemstones. He also had a nice set of crystals, especially with ruby and painite association.

Nice painite days!

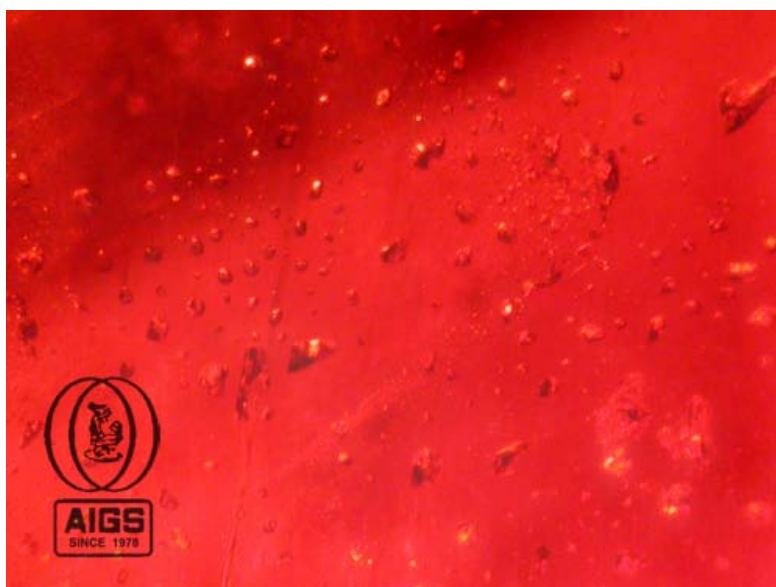
All together I can say that these 4 dealers had together around 1000 pieces. From this, I estimate around 180 pieces, weighing from 0.1 carats to 3+ carats, could be used to produce black or brown, or at best, dark brownish red faceted gems. Only a very few of these faceted stones, however, will have noticeable beauty and an obvious open tone. Mogok painite is almost always nearly black and nearly opaque.



(A group of painite crystals from west Mogok from the parcel brought to AIGS lab in Bangkok, Thailand. The largest (top right) weighting 71 carats, the second largest (top left) 53 carats. From the 2 small crystals in the front, one of them: on the right, turned to be after identification... a rutile crystal!)



(Details on the 71 carats painite crystal, the parcel largest single crystal)



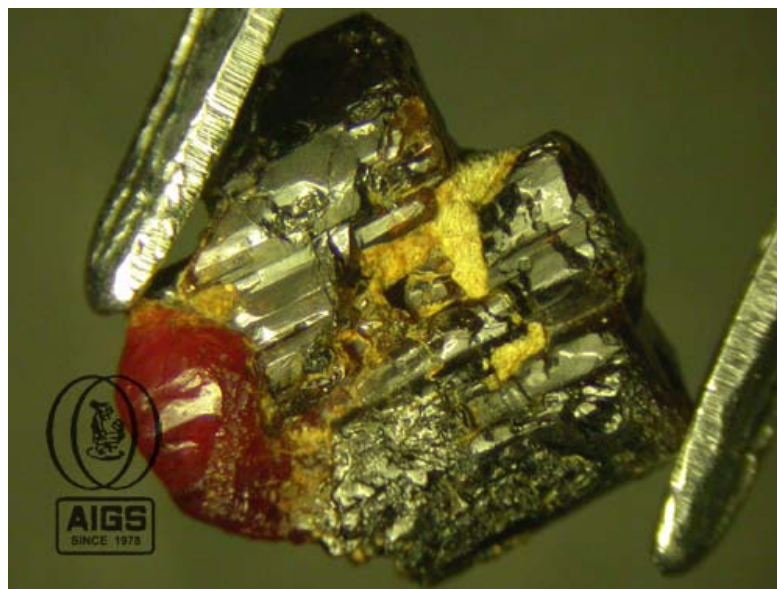
Negative crystals inclusion plane in a west Mogok painite (magnification 40x),
Some of them seem to be two phases (liquid and gas) filled cavities

Here are some samples of west Mogok painites in matrix:



The first stone on the top is a long striated crystal well terminated on an iron rich matrix.

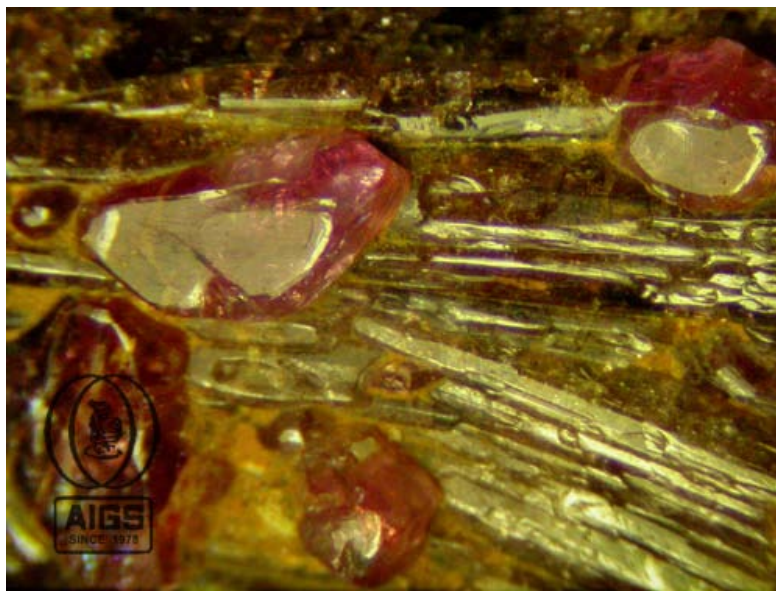
The 3 other samples present interesting association with small ruby crystals.
More details on this association can be seen on the following photo I took using my gemological microscope,
Stone courtesy: <http://gemwow.com/>



(My favorite microcrystal! A beautiful small ruby crystal associate with some fine small painite crystals. Stone courtesy: <http://gemwow.com/>)



Some nice painite crystals associated with rubies from the specimen on the right.
(Magnification 30x, Stone courtesy: <http://gemwow.com/>)



Interesting small ruby crystals on some painite aggregate crystals from the specimen on the left. (Magnification 40x, Stone courtesy: <http://gemwow.com/>)



(Other photos of painite crystals associated with rubies on matrix from the 700 stones parcel)

Some gemological data about painite:

Formula: $\text{CaZrB}[\text{Al}_9\text{O}_{18}]$ but Ti, V, Cr, Fe and Hf are also present

Crystal System: Hexagonal

Color: Pink, deep red, brown and black.

Luster: Vitreous to sub-adamantine.

Hardness: 8+

Density: 4.00

Refractive Index: Over 1.78 (1.790 and moving).

Birefringence: --

Optic Character: Uniaxial (-) (lower shadow is moving).

Pleochroism: Yellowish-brown, red and purplish brown

Fluorescence: None observed at AIGS lab but some was observed by [Prof. Rossman](#) on Namya Painites

Fracture: Conchoidal, uneven.

Stone size: the largest piece found was over 50 carats (rough)

Stone availability and localities:

From Onhgaing, central Mogok, Burma: Few pieces were found from the gemstone discovery in the 1950' to early 2005.

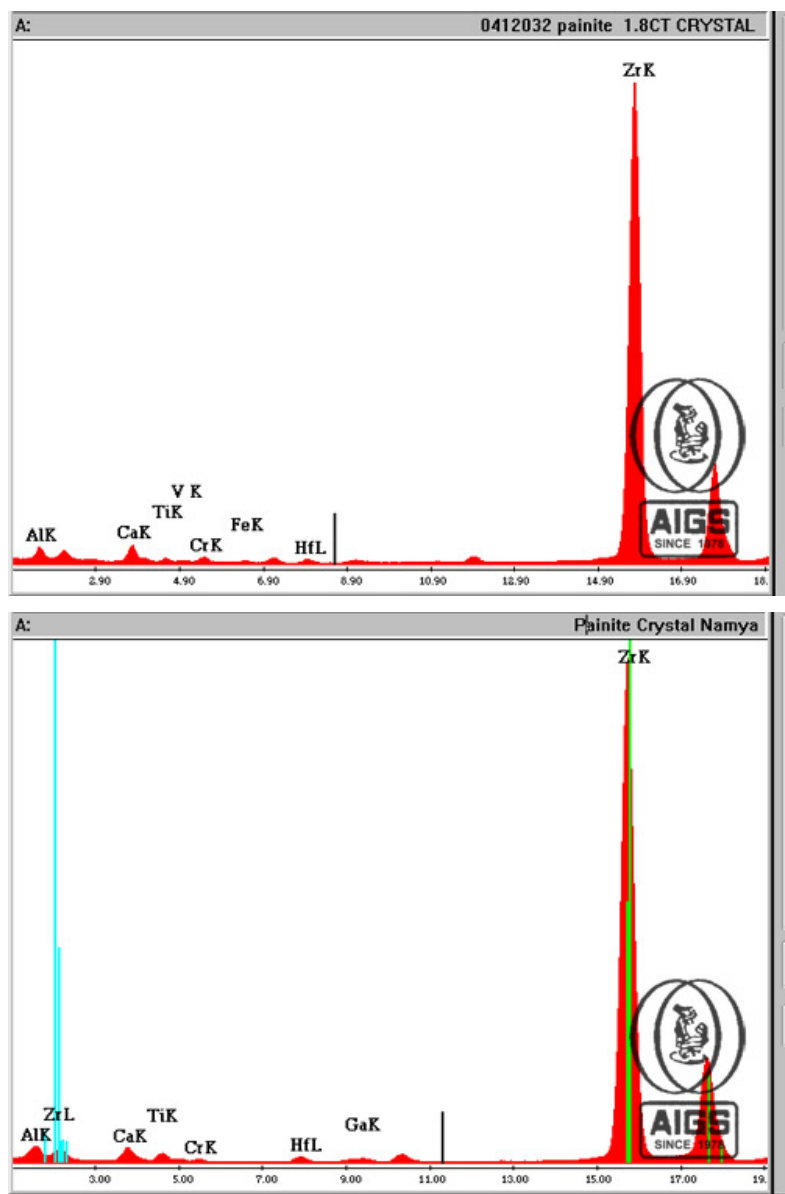
From Namya, Kachin State, Burma: few pink pieces were found after 2004.

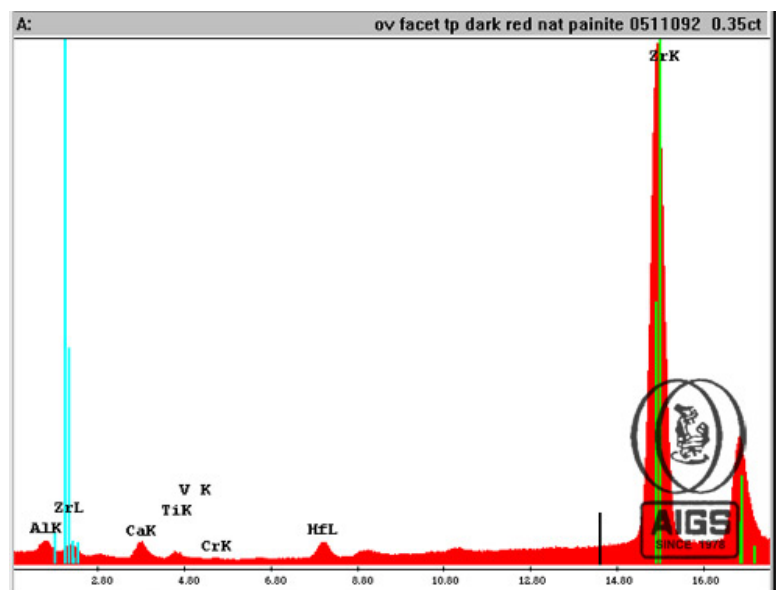
From Kyauk Pya That, West Mogok, Burma: Numerous pieces were found from several mines after July 2005 as several pockets of painite were found at Thurein Thuang and other places near Kyauk Pya That monastery

Comments : Some pieces are associated with rubies.

Paintites are identified at AIGS Gemological Laboratory, Bangkok, Thailand using both traditional gemological techniques and advanced instruments such as an EDAX DX-95 EDXRF, NICOLET Magna-IR Spectrometer 550 FTIR and HITACHI U-4001 photospectrometer.

Here are some spectra we collected from painites of different mines:





(EDXRF spectrums respectively from [painite number 9](#) (from Onhgaing, Mogok), [painite number 19](#) (crystal from Namya), and a 0.35cts painite crystal from west Mogok, Burma. Zirconium shows some very high peak in all cases. Al, Ca, Ti, V, Cr, Fe and Hf were also detected in the "Mogok painite" while in the "Namya" and the "west Mogok" painites only Al, Ca and Hf were presenting significant levels. This qualitative analysis and the semi quantitative analysis that we performed from these spectra has given the confirmation that the stones observed were painites as the chemical composition of the stones observed was matching the data we had on painites.)

Mogok Painite stories for you to share the "painite atmosphere in Mogok, Burma ":

Mogok "painite story" number 1:

A Mogok person was the owner of a red color crystal with good shape and terminations since 1992. He suspected his stone to be painite and showed it regularly to some of his visiting friends (Either foreign gemologists or Burmese people having some interest in gemstones). But nobody thought it could be painite: Most probably red zircon or tourmaline... He kept his stone like that for 12 years in his collection. In January 2005, a gemologist owning some painites came to his house and talk about this rare gem. While talking he noticed a red tourmaline like gem on a dusty show case. After careful observation he was 95% sure the stone to be painite.

He performed some tests on the crystal:

Hardness? Over 8...

Pleochroism? Strong...

Refractive Index? Difficult to see on the crystal but one thing was clear: The lower shadow edge was moving meaning than the stone optic sign was negative. Zircon which is uniaxial positive was not possible anymore.

The stone specific gravity was found to be 4.01 using hydrostatic balance which is far too high to be tourmaline which is usually around 3. Finally a uniaxial interference figure was found between cross filter using immersion technique.

No doubts anymore, it could not be tourmaline or zircon as only painite fit to this data!

The owner was very happy and excited. The stone is now known as painite No 12 but if the owner and the gemologist had met earlier the stone could have got a lower number. The owner was very pleased about this "lucky" number which is equal to the number of years he has kept the stone without being sure of its real nature. The gemologist said that he was very pleased and happy about his performance that make the owner discover that he possessed a rare and valuable gem.

Mogok "painite story" number 2:

Two Mogok friends were looking at stones from a local dealer. The "first friend" found an interesting brown colored gem rough. He presented it to his friend: The "second person". The second person recognized the stone as painite but said nothing: At that time, the current stone owner was not willing to sell it. They decided to wait in order to buy it. After one week, the "second person" told the "first friend" about the stone nature. They decided then that they will buy it as a 50% share. The next day, the "first friend" told the "second person" that the painite owner has sent the stone to Yangon... So there was nothing else to do than wait. Few days later, the "second person" had a chat with a third Mogok dealer who told him that a Mogok geologist has bought a painite as a share with the "first friend".

As the third mogok dealer was describing the gem, the "second person" understood that it was the stone he has seen before: The stone was never sent to Yangon!

At that time he knew that he was betrayed by his friend: The "first friend" as this man has bought the stone with a geologist after telling him that the gem had left to Yangon...

The gem is nearly two carats, hexagonal, broken up and down, good prisms, a small fracture and facetable quality.

Part 2: Is it such a thing as a "color change" painite?
By Vincent Pardieu (AIGS Lab)

Some painite dealers have brought to my attention recently an issue about possible "color change" painite... Well, could some gemological rarity be added to the properties of the rarest gemstone on earth? As I had at this time the chance to have several hundreds painite crystals on my table at AIGS lab, I've spend some time wondering about this issue...

I've examined several hundreds of painites from November 14th to November 18th 2005 at AIGS lab about this aspect and here is what my opinion about this subject is:

What is color change? Color change is a complex topic which is historically related to the gemstone Alexandrite: discovered in 1830. It was described as "Emerald by day and ruby by night" meaning that the stone under "daylight" was green and at night red, of course at night was referring to in a lighting environment dominated by "candle light" which is of the incandescent type.

My friend Laurent Massi currently completing a PHD in gemology at Nantes University in France is a serious fan about color change stones. He used to tell me that color change is a phenomena coming from the combination of 3 factors: The stone, the light used to look at the stone and the way the human brain is analyzing the information. Color change can be complex issue as there is no real world wide accepted standard light environment to analyze the phenomena.

Personally I like the "natural day light" and a "natural wax candle light" as it was with these lights that the story has probably begun for Alexandrite, but nowadays people are mostly speaking about fluorescent "day light" versus incandescent bulbs.

What we call usually incandescent light can vary depending of the composition of the candle or also the type of bulb used and for fluorescent light there are also different manufacturers and as a result different lights.

Even "natural daylight" is an issue as it not stable either: It vary from morning to noon, with the orientation of the window and also with the latitude: Morning north orientated day light in Bangkok, is not the same as mid day west orientated day light in Moscow.

Currently I've the feeling that some persons depending the light environment they are using and because they are willing to see some color change, might feel that this or that painite brown color under daylight is more or less green. Our brain can trick us... So for this study I've examine many stones under Bangkok natural daylight, using different types of fluorescent day light tubes and some incandescent sources. To complete that I've compared the UV-VIS spectra of different painites with the spectra of a natural ruby from Thailand, a natural emerald crystal from Colombia and a natural alexandrite from Tunduru in Tanzania showing a moderately strong color change.

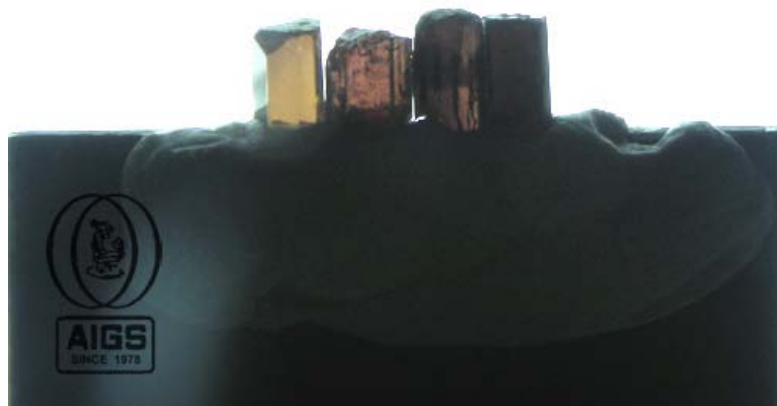
To begin I would like to present you some photos about painites under different lighting environments. First the light used was placed over the stones. As a reference I've let in this painite parcel a small rutile crystal (which for the little story was sold to me as painite along with the other crystals but was obviously not it has very fine tetragonal crystal shape).





Some crystals present an interesting variation in color from light to dark brown in fluorescent light (top) to orange or red in incandescent light (down). This observation performed by some AIGS Lab customers was the starting point of this study, as they were willing to know if we could issue a report with "color change" painite...

As you can see the well formed red rutile crystal in the center does not change much in both lighting environments compared to the other crystals. On the following photos you will now be able to study some of these painites using the same light environment as over but now with the light source placed behind the crystals to study the transmitted color. The crystals were chosen as they had some different coloration from brownish to reddish and were big enough to be able to collect later some UV-VIS orientated spectra.

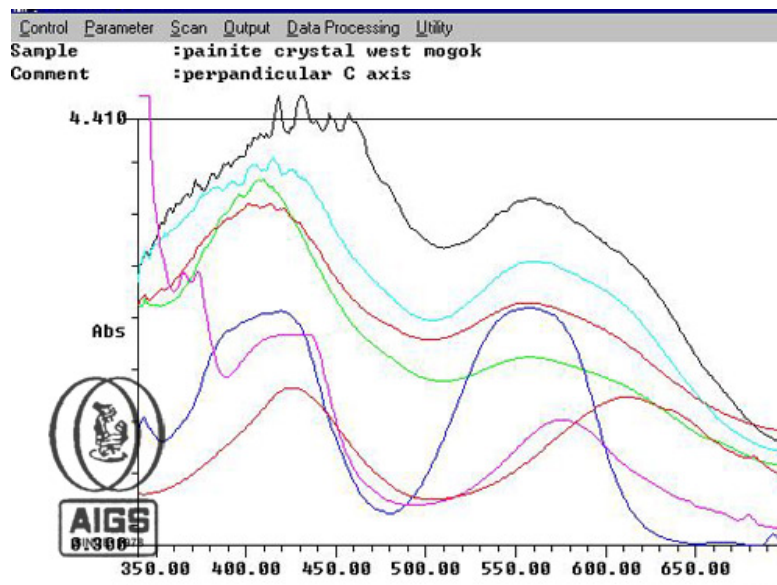




The crystals are turning from brown to a more orange brown in daylight to an brighter orange red in incandescent light. The main change here is in saturation not in hue as brown is a low saturated orange.

[Professor George Rossman](#) has described in his study several painites as "dichroic" with "orangy red" and "pale purplish" dichroic colors.

So we have studied the stone using UV-VIS spectroscopy and compared the painite spectra from 350nm to 700nm (visible spectrum is 400nm to 700nm) with 3 other stones colored by chromium: ruby, emerald and alexandrite. As chromium is in these stones under a different environment, the energy levels are different and the absorption varies, thus chromium turn emerald in green, ruby in red and alexandrite in red or green depending the nature of the light used to examine the stone.



(The spectra are the following: the three lower spectra are dark blue: ruby, red: emerald and pink: alexandrite.

The 4 upper spectra are the spectra of the four painites.

On the other photo, the stones go from left to right with the following colors
on the spectra: green, red, blue and black.)

The fact is that the painite spectrum is very close to the ruby spectra for the maxima position of three painites but the last one, the darker one with the black spectra has one of its maxima (560nm) close to ruby and the other one around 430nm closer to emerald. An important difference is that painite has a global higher absorption between the two peaks. The window at the end of the spectra in the red is very dominant which explain the strong red color in incandescent light. Nevertheless the valley minima for all the painites between the two absorption peaks are close to emerald valley minima... This is interesting as regarding to this aspect in a very red deficient light environment it is possible that some stones could appear greenish brown if the green component get stronger than the red one... But as the valley in the red is much deeper than the valley in the green, then it is very unlikely for this phenomena to be easily visible as in alexandrite where the two valleys are similarly important.

But even if in a very red deficient lighting environment the stone could appear greenish and some people using their special fluorescent day light tube was convincing me that the stone under this special light was greenish brown, the fact is that the light under which the tradition of color change was based on is day light versus candle light:

In the XIX century "color change" was describe for alexandrite which was " emerald by day and ruby at night". As gemology is not only about science but also about traditions I think that this tradition should be taken in consideration: Natural day light is never that red d

efficient, so I don't think that I will see soon such a thing as a "color change" painite... from natural day lighting to a restaurant candle light.

Painite will probably be brown to red depending of the light environment. But I guess that my Burmese and Bangkok friends getting hot on painite and its possible "color change" will do their best to bring me one day a stone to make me change mind! I wish you to success... and... will be happy to study this wonder!

After this small study it is my opinion that in the case of painite there is no color change... Currently in the case of all the painite I've examined, I haven't seen anything obvious enough and as the colors in consideration are from a tricky low saturated brown to a bright dark red.

As a result we have decided at AIGS laboratory not to issue for instance any report mentioning a possible "color change" for painite. But bring us the stone and we might after some "hand on study on the specimen" change our mind!

We invite all our visitors willing to get more information and references about this interesting gem and its amazing story to visit the very informative and well researched page in which Prof Rossman has put the result of his work on the subject. It is in my opinion the first and most comprehensive study about painite up to this date:

Prof Rossman "Painite bible" webpage:

<http://minerals.gps.caltech.edu/FILES/visible/painite/Index.htm>

I invite you also to visit this informative painite reference page:

Mindat.com references: <http://www.mindat.org/min-3063.html>

Other references:

Color Encyclopedia of Gemstones, second edition, Joel E. Arem

Gems Their sources, descriptions and identification, 5th Edition, R Webster

Myanma Gems, Ministry of mines, Yangon, Myanmar

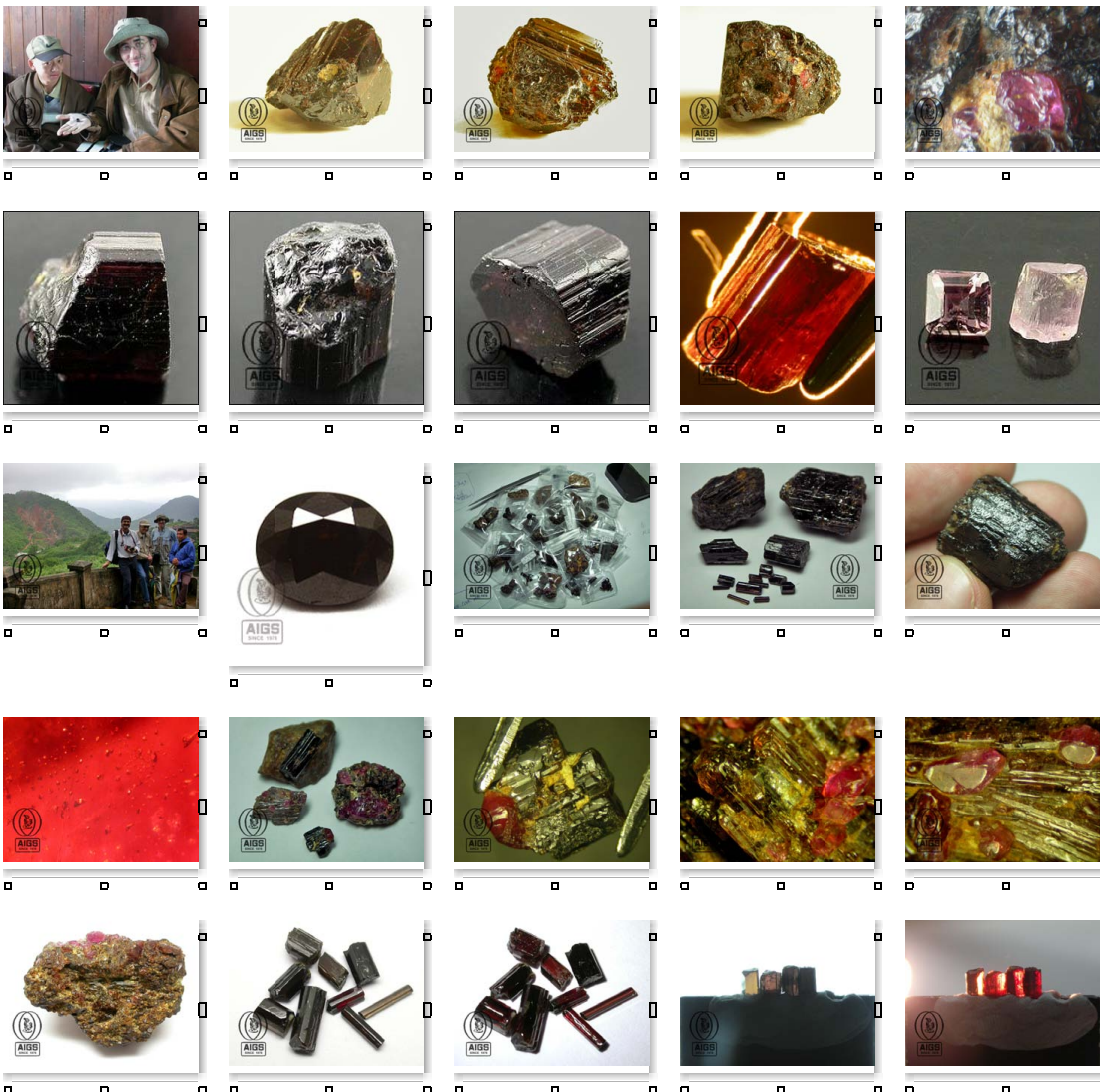


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