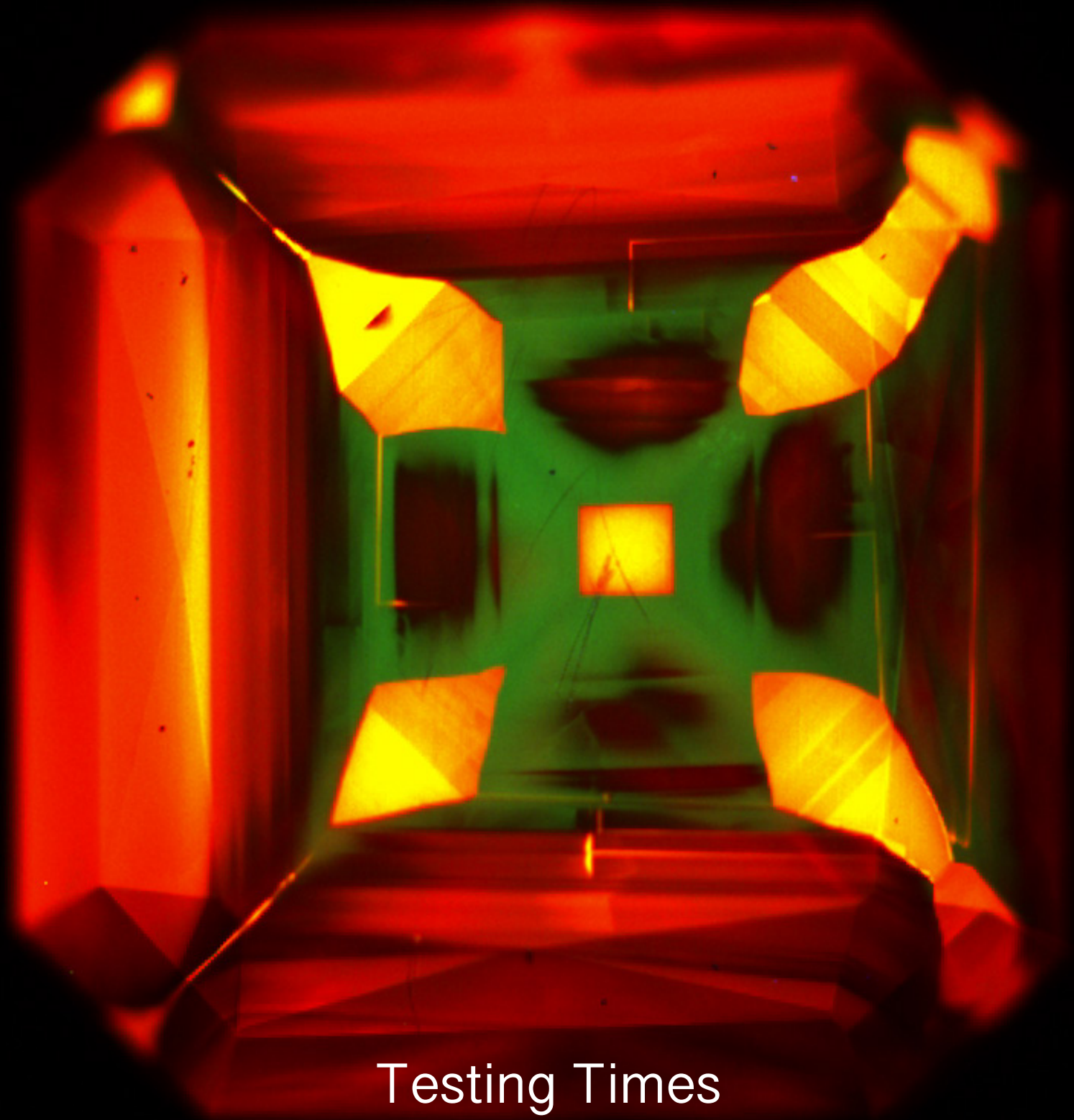
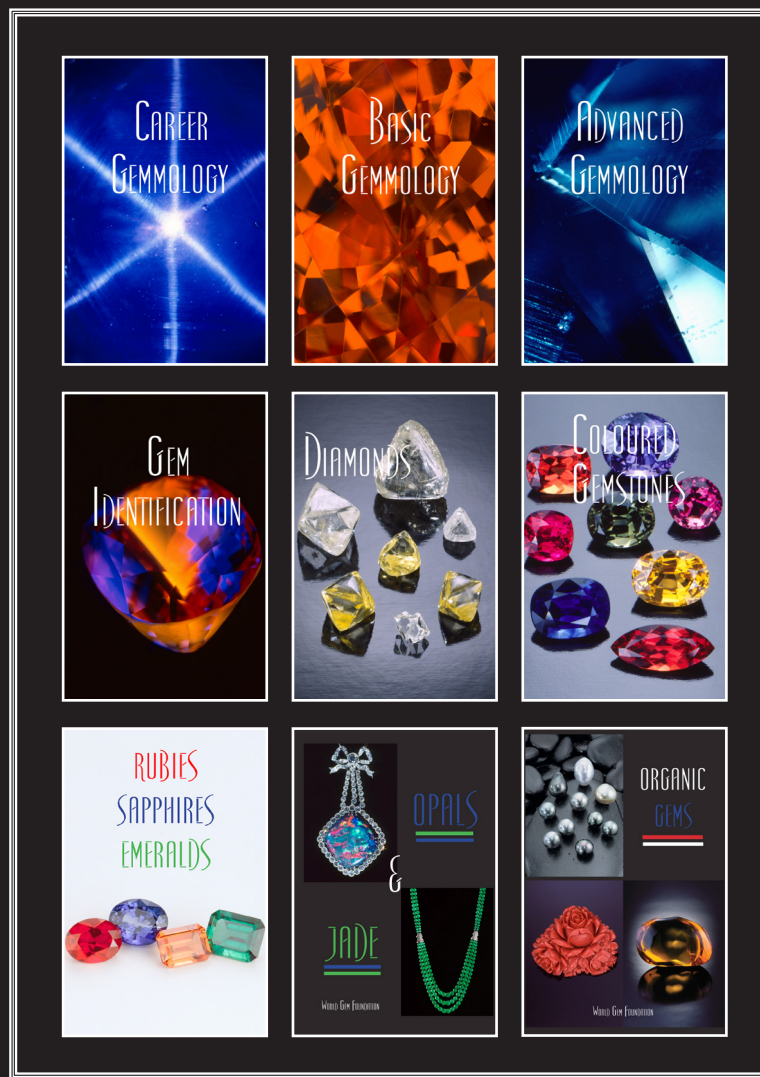


Gemmology Today

December 2019
Quarterly Publication



Testing Times



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WORLD GEM FOUNDATION

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Cover Photograph ' Lab-Created Red Diamond (Irradiated & Heat Treated) Courtesy of IGE gem Testing Laboratory.

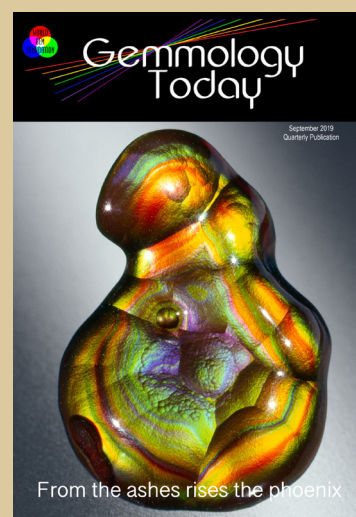
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September 2019 Issue



Editor — at Work

Geoffrey M. Dominy is the author and creator of the 'The Handbook of Gemmology' and 'Gemología Para Todos', founder of the World Gem Foundation and editor of Gemmology Today.

Recently the Diamond Producers Association (DPA) started an initiative that to me is not only desperately needed but will also be viewed as one of those 'evolutionary' moments that helped shape our industry.

Up until now, we have relied on instrumentation that was sold by manufacturers without any third party certification. It is strange that so many people place their trust in gemmological laboratories to certify diamonds and coloured gemstones, yet they use instruments that have not been tested. Relying solely on the claims from the manufacturers that the data they yield is correct.

With the ASSURE initiative from the DPA, we now have an independent third party that tests the reliability of diamond screening instruments used to distinguish between natural and lab-created diamonds in both melee and larger sizes, providing a detailed analysis of the tests based on the same set of test stones.

WOW.....I have been in this industry for 39 years and while I am very excited about this initiative, I am also wondering why it has taken so long? The answer of course is the very real challenge that lab-created diamonds present to the industry and the very real need for diamond dealers, wholesalers, manufacturers, jewellers and appraisers to be 100% certain that the origin of the diamonds they are selling or appraising is proven. Once again, it is the diamond industry that takes the initiative and while it has been borne out of a fear that lab-created diamonds could hurt the diamond producers, I applaud them for doing it.

Of course the next step is to get this instrumentation into the hands of the people who are dealing with diamonds on a daily basis and that, perhaps more than setting up

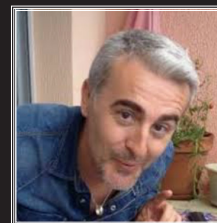
an independent body to test their reliability, is the real challenge.

Frankly, I am staggered by the number of people who have not invested in one or two screening devices. In 2014, I left the field of appraising to write and start the World Gem Foundation. I believe I left at the right time because without proper instrumentation, I would not have been able to say with any certainty that a diamond was natural or lab-created and that worried me. With so many manufactures and designers using micro-pave settings and diamonds as small as 0.5mm in diameter, this would have been very challenging indeed.

My advise to you is to go out now and buy one of the ASSURE tested diamond screeners based on your own personal needs because while the cost of these instruments can be quite high, the financial fallout from making a mistake can be far higher. These instruments are not a cost of doing business, they are an investment in your business!

Continuing on with the theme of testing, Nina Zolotukhina presents her first article for Gemmology Today. While perhaps a little less scientific than the ASSURE Program, her testing of eye loupes is truly 'eye opening'. Again, the reliability of one of the most basic gem testing instruments has never been questioned but why not? Two years ago, we published an article by Michael D. Cowing entitled 'CZ Master Stones: A Blessing or a Curse?', where he provided proof that not all CZ master sets are accurate and this truly shocked and worried me. This has to change and manufacturers need to be held accountable.

On a lighter note, I hope you enjoy the festive season and the articles in this issue. May 2020 bring joy and happiness to you all.



Blue Gahnospinel Crystals from Nigeria

Introduction

While surfing the Internet and several social networks, a posting showing deep blue, octahedron-shaped crystals reportedly from Nigeria caught our attention. We subsequently purchased four reference samples from the supplier.

The following gemmological and laboratory data is reported here in order to determine the exact nature of these spinel-shaped crystals and the origin of their deep-blue color.

Material and Method:

Samples:

Four crystals, each weighing 2.02 carats, 0.63 carats, 0.46 carats and a twinned crystal of triangular shape weighing 1.00 carats (4.11 carats in total) (Figure 1).



Figure 1 - Four crystals in incident D65 daylight equivalent

Visible-NIR spectrometry using an Ocean Optic USB 4000 spectrometer equipped with a homemade setting involving an integration sphere.

Fourier Transform InfraRed (FTIR) spectrometry using a Bruker Alpha spectrometer using a low noise DLaTGS detector, equipped with a diffuse (or specular in this case) reflectance type (DRIFT) signal capture module and was run at 4 cm^{-1} resolution.

X-Ray Powder Diffraction (XRPD) using a 2nd generation Bruker D2-Phaser diffractometer.

Energy Dispersive X-Ray Fluorescence (EDXRF) spectrometry collected with a homemade spectrometer involving a silver-anode X-Ray tube running under 10 to 40 kV and 5 to 200 μA and a silicon CCD detector. This setting was chosen to detect elements that were heavier than sulphur.

Specific gravity determined with a homemade set up involving a Dendritic Gem Scale.

Reactions to ultraviolet radiation (shortwave and longwave) evaluated in a dark box lit with 6W UV tubes.

Results and Related Comments:

When observing these four crystals, we immediately thought of the 'Spinel' mineral group since octahedrons and triangular twinned crystals are strongly indicative of minerals belonging to this group. As the blue color is most often encountered in the spinel mineral species, one could guess that these crystals could be spinel.

Under the polariscope, the reaction was one consistent with isotropic material with the tabby extinction (anomalous birefringence) expected for a mineral belonging the spinel group (Figure 2).

Although spinel will often fluoresce under SW & LW ultraviolet light, the four crystals did not exhibit any fluorescence.

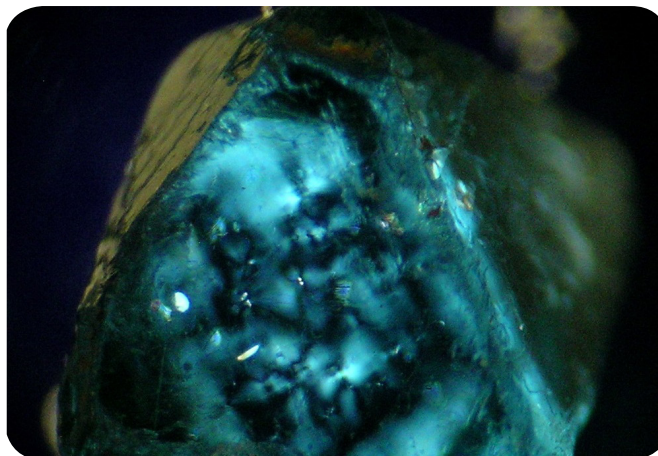
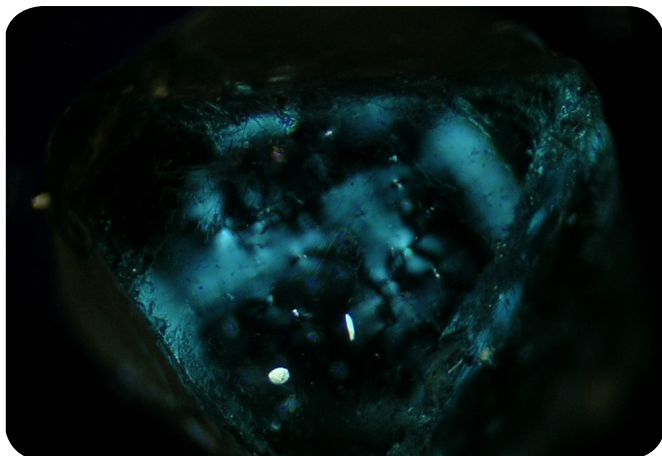


Figure 2 - Between crossed polarizing filters (polariscope), dark shadows were seen. These shadows changed shape and position when the stone was rotated indicating 'tabby extinction' or 'anomalous birefringence'. However, as the stone was rotated, it did not change from light to dark (typical of anisotropic gemstones), indicating that it was isotropic.

Under magnification and crossed polarizing filters, anisotropic inclusions could be seen (Figures 3 a, b and c, d) and after referencing 'The Photoatlas of Inclusions in Gemstones Volumes 1 & 3), it appeared, in all probability, that they were apatite inclusions.

The specific gravity (conducted on each stone separately and collectively for greater accuracy) was 4.50. The refractive index, taken on a polished face and on a smooth

enough natural face, was over the limit of the contact liquid (R.I. of the contact liquid was 1.788). According to GIA, spinel has an S.G. of 3.06 and an R.I. of 1.718, while gahnite has an S.G. of 4.55 and an R.I. of 1.800. As a combination of the two, gahnospinel's S.G. can fall anywhere in between. The values for S.G. and R.I. were consistent with these observations.

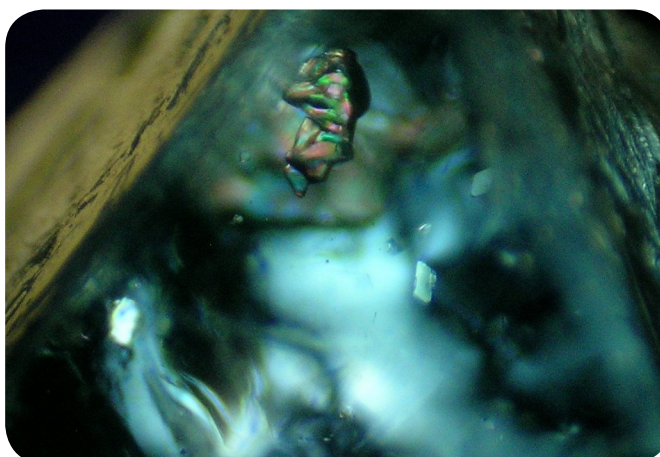
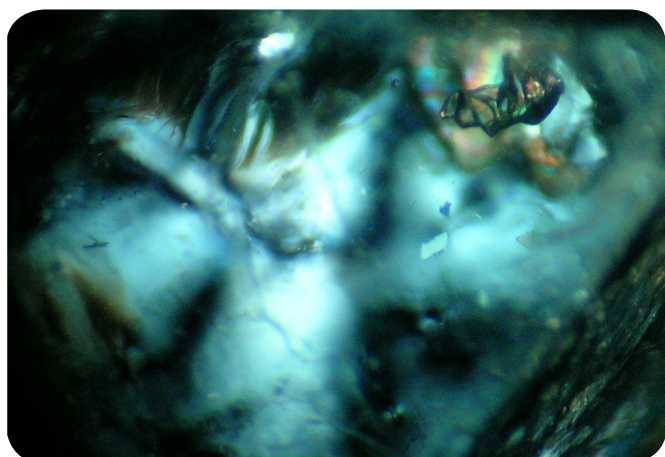
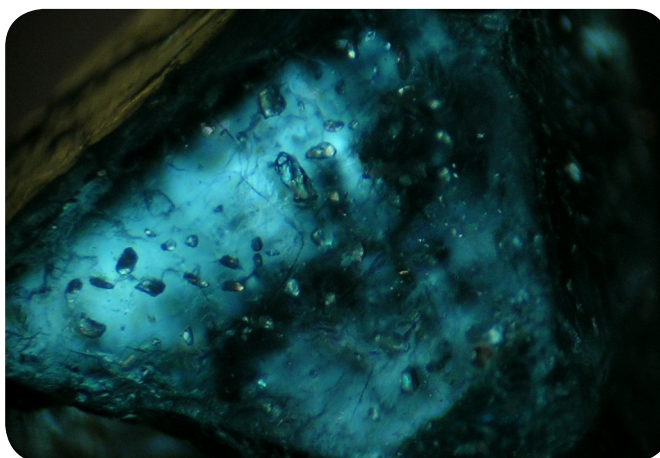
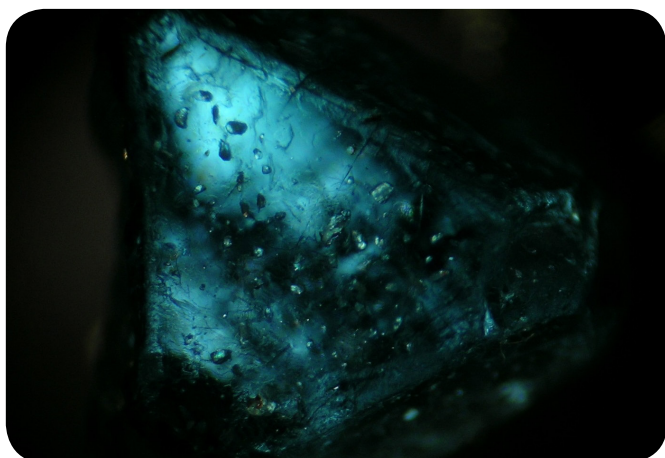


Figure 3 - Under magnification between crossed polarizing filters several anisotropic inclusions could be seen (light polarization wasn't the same in the inclusions when the stone was rotated at ~45°). These inclusions could be apatite crystals.



Figure 4 - Spectrum observed using a prism spectroscope

An observable spectrum using a prism spectroscope showed absorption bands in the red, orange to yellow, light blue, blue and a cut-off in the indigo to violet part (Figure 4). These are indicative of a coloration from iron and presumably from cobalt.

At the laboratory, visible near infrared (Vis-NIR) spectroscopy indicated iron and cobalt related bands (Figure 5). The bands at 460, 475, 560, 585, 665, 725 and 925 nm are due to iron (Fe^{2+} , Fe^{3+} ; D'Ippolito et al. 2015). The bands at 550, 575, and 622 nm are due to cobalt (Co^{2+} ; D'Ippolito et al. 2015). Note that although cobalt is a powerful coloring agent, the deep-blue color of these gahnospinel is predominantly due to iron.

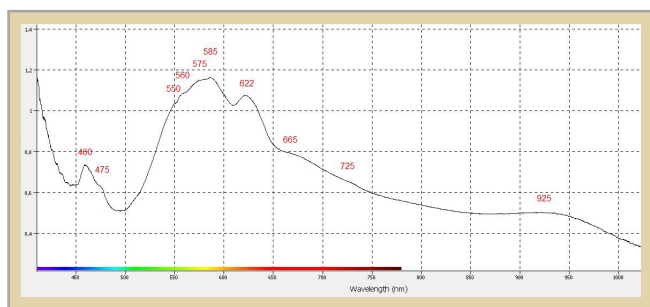


Figure 5 - Typical Vis-NIR spectrum

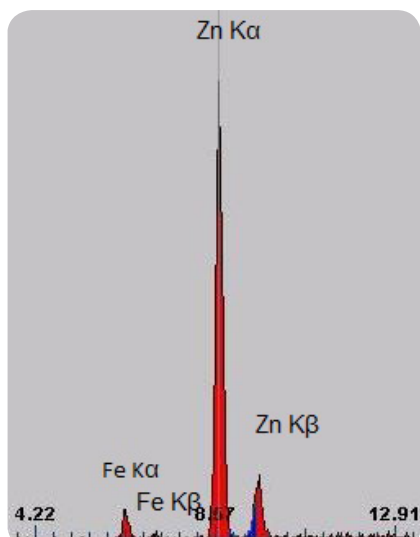


Figure 6 - Typical EDXRF spectrum (8.64 Cursor). The expected zinc content for Gahnospinel was obvious (Zn Kα 8.64 KeV, Zn Kβ 9.57 KeV). Iron was detectable too (Fe Kα 6.40 KeV, Fe Kβ 7.06 KeV) but not cobalt (too low concentration). Note this equipment allows for the detection of elements heavier than sulphur.

Energy Dispersive X-Ray Fluorescence spectroscopy showed, as expected for gahnospinel, a strong zinc content (Figure 6 Zn Kα and Zn Kβ). Iron was detectable (Figure 6 Fe Kα and Fe Kβ). Cobalt, although it could be seen in the Vis-NIR spectroscopy, was not detectable in EDXRF due to the low concentrations.

In order to definitively and structurally identify this mineral phase, some fragments were broken from the smallest crystal. Resulting shards were then powdered for an X-Ray Powder Diffraction analysis (Figure 7). The resulting powder diffraction pattern matched perfectly with the Gahnite-Spinel mineral phase.

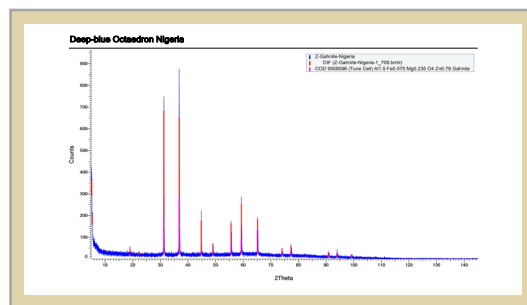


Figure 7 - X-Ray Powder Diffraction (XRPD) pattern (blue trace with red assignments-sticks) of the material studied. A perfect match with Gahnite-Spinel mineral phase was found (pink assignment-sticks).

As specular reflectance Fourier Transform InfraRed (Specular-FTIR) spectroscopy is a powerful non-destructive spectroscopy method for further gem identification (cut or rough) the four spectrums of the crystals were recorded (Figure 8), then referenced in our identification database. It was interesting to note, within this technique, the differences that exists between iron rich spinel (Spinel-Hercynite Figure 8 pink trace) and gahnospinel.

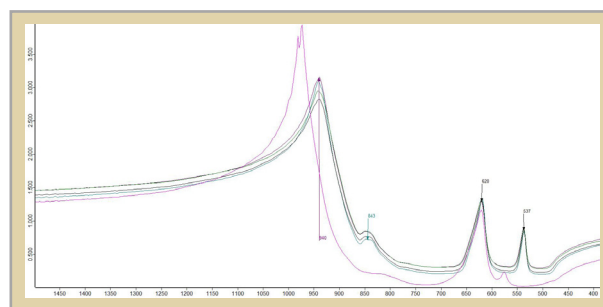


Figure 8 - Specular reflectance FTIR spectrums for the four crystals with peaks at 940, 843, 620 and 537 cm^{-1} , compared to a Spinel-Hercynite reference (pink trace). This non-destructive method can be used in the separation of spinel and gahnospinel even when the specimens are rough.

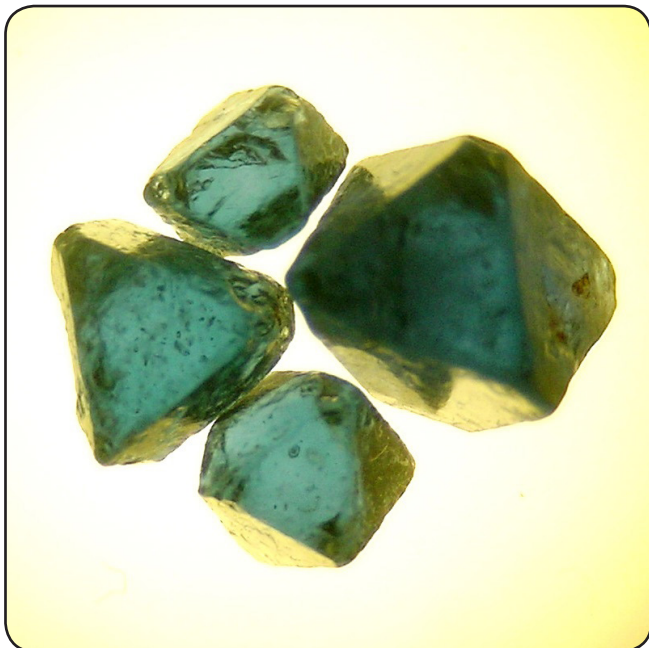


Figure 9 - Crystals in transmitted Light

Conclusions:

These four crystals, reported from Nigeria, have been identified as natural gahnospinel (close to the end member Gahnite of the Gahnite-Spinel series) and are colored by iron and cobalt traces.

As this blue color is attractive and gemmy quality gahnospinel especially in well-formed crystals with a very clear crystal habit, are uncommon, one suspects that this material will become an appreciated 'collection' or 'jewelry' item.

Acknowledgements:

Thanks to Mr Sternis E. for his contribution in reference sample (Spinel-Hercynite) and samples preparations.

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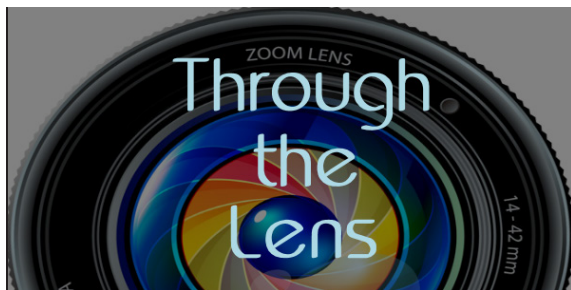


Gemmology Today Quiz #13

- Fifteen questions
- No time limit
- No pressure!

This quiz is a little different to the previous ones. Let's see how you do!

Click [here](#) to start



A third generation rockhound who has turned his favourite hobby into a blossoming career photographing gemstones, Jeff Mason is a man who loves pushing himself while at the same time redefining what is possible.

Chasing Unicorns



Jeff Mason

GT: Who is Jeff Mason? Tell us about your background?

JM: I'm a culmination of a thousand interests. I love learning and pushing myself to redefine what is my possible. I have always loved the outdoors and rocks. This came very early on. Ever since I could remember I have collected rocks and gems. I used to pick up rocks wherever I would go. I'm a third generation rockhound. My Grandparents mined jasper, my parents mined turquoise. When I was a young child, I would take my parent's Turquoise and fill my Tonka trucks. From there the passion grew. I started cutting cabs when I was a teen. When I got in trouble I would be forced to cut slabs, I must have cut thousands of pounds worth of Turquoise. In high school I started doing gem shows. I have been to the Tucson Gem and Mineral Show most every year since I was 15. When in college, I studied geology for two years before I switched to GIA and studied Applied Jewelry Arts and Gemology. During my time at GIA I got my first industry job and then was working to find the exact spot in the industry I liked the most where I could thrive. I then

studied economics and business, thinking I would learn as much as I could to make a business succeed in an ever-changing landscape.

GT: When did you first develop a passion for gemstone photography? Was there a defining moment when you realized this was what you wanted to do?

JM: I developed a passion for Gemstone Photography after graduating GIA. It was looking into a microscope and seeing a new world that inspired me to take photographs of gemstones and jewelry. The defining moment was when I worked as a gemologist for a T.V. show. I was shown that being a jewelry photographer was a possible career and with hard work and a bit of luck I could call it my career.

GT: Natural talent or acquired through study?

JM: I believe that natural talent has very little to do with my photography; to become an expert you need to spend hours taking photos, editing, critiquing, reshooting and making improvements. There are so many small details that go into jewelry photography that it can take a good deal of time to learn how to create beautiful photos.

GT: Accomplished anglers always talk about the 'one that got away'. Is there one gemstone shot that has eluded you over the years?

JM: Red Beryl. I once was handed a coffee cup filled with rough Red Beryl from an old timer who used to work the claim in Utah. I had the opportunity to photograph one of the unicorns of the gem world but was not skilled enough at the time to be proud of the end results.

GT: What is the one most memorable gemstone you have photographed and why?

JM: I have had the opportunity to photograph a plethora of amazing gemstones but the most memorable was a multi-color sapphire. It was amazing. The dominant colors were bright yellow-orange and purple it had a line of green by the keel of the stone and under a polarizing filter it would

completely change from purple to yellow-orange. It was only a few carats but it had so much personality that I fell in love with it. I actually took photos of it while turning the polarizing filter and made it into a movie that would show off the entire color change.

GT: Is there still a place for analog film in the world of gem photography?

JM: In the world of gem photography I do believe that film is a thing of the past. There is a great deal of increased flexibility with digital and the camera technology continues to get better with higher resolution files being created. When it comes to the digital darkroom, dust removal is easy. Making a clipping path and putting images on a white background for online sales is easy. It's what people want and is only possible with digital mediums.

GT: There are pros and cons to everything but in the age of digital photography, do you feel that many photographers rely too heavily on software such as Photoshop? Is there a downside to this technology?

JM: In the age of digital photography, some photographers do rely too heavily on software. The downside of digital editing is misrepresentation of the subject. The upside is that the digital darkroom unlocks a realm of creativity that takes marketing to a more captivating level. With innovation there is always the want to push to see what is possible; you also have to reflect with the question, is this ethical?

GT: Guitarists are always asked about the equipment they use and the ones they most prefer. What is your camera of choice and why?

JM: Currently my camera of choice is a Canon 5d Mark iii. I have used this camera for years and it has done a great job of serving me well. I mainly use Canon because, at the

time when the Mark iii came on the market, it was one of the finest cameras on the market. I already owned a wide assortment of Canon lenses and it made sense to be brand loyal. If I switched brands of camera I would have to switch lenses and it could end up costing a large amount of money depending on how many lenses I would change out. With that being said, in the future, I plan on making a change to a Sony A7R IV. The Sony mirrorless cameras have proven themselves to be dominant in the last few years and the future will be mirrorless not DSLR.

GT: Where do you see the future of gemmology ten years from now?

JM: When you say gemmology, I think of it as the study of faceted gemstones that includes all activities from mine to market. That said, ten years is a lot to speculate upon in that kind of market, and we have seen big leaps in industry change in the last ten years.

In the next ten years I do foresee market disruption and technological changes. I believe that it will be a very exciting time and a challenging time. We will see new treatments as we always do and there will be new technologies to identify treatments. We will see a strong reliance on laboratories to keep companies honest.

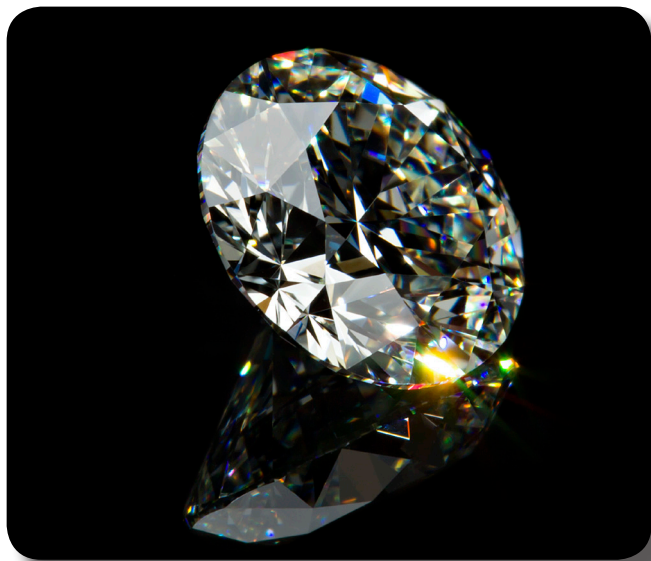
I think we should expect more vertical integration of supply chains and more companies utilizing social markets and technology to go straight to consumers. This could cause a massive disruption to retail jewelers. I also think as a side effect of vertical integration, companies might try to internalize lab reports. This could create a conflict of interest.

I believe part of a market disruption is end consumers wanting to know that their gemstones have been mined ethically. They also want to know the story from mine to market. The company that can use technology to create the most captivating story with amazing gems will have a big lead in the market. Social Media is a great story-telling platform and people love to have a personalized story about the companies they support.

GT: If we were sitting here a year from now celebrating what a great year it's been for Jeff Mason professionally, what would you say was the reason?

JM: In a year from now, I would say the reason for a great professional year would be gratitude. I have a lot to be grateful for. I get to make a career out of my favorite hobby. I get to photograph beautiful gemstones and jewelry. I get to work with wonderful 'creatives' that inspire me.

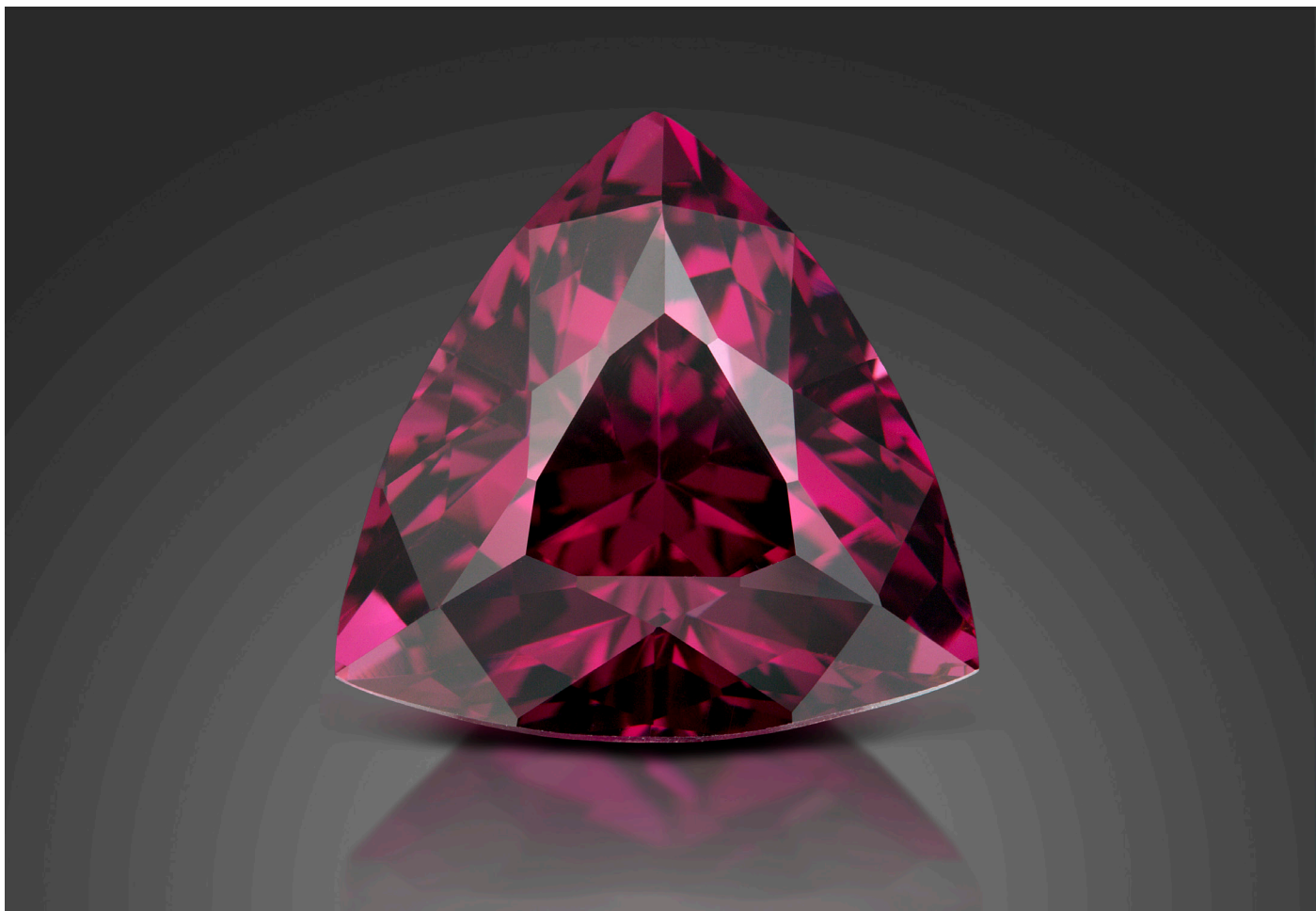
After gratitude, there is discipline and persistence. If I want this year to be great I will need to have the discipline to show up, work a full day and do my best with each project.



Diamond 'Dancing in the Light' (Photo by Jeff Mason)



Multi-Coloured Sapphire (2.46 carats) (Photo by Jeff Mason)



Tanzanian Rhodolite Garnet (9.04 carats) (Photo by Jeff Mason)



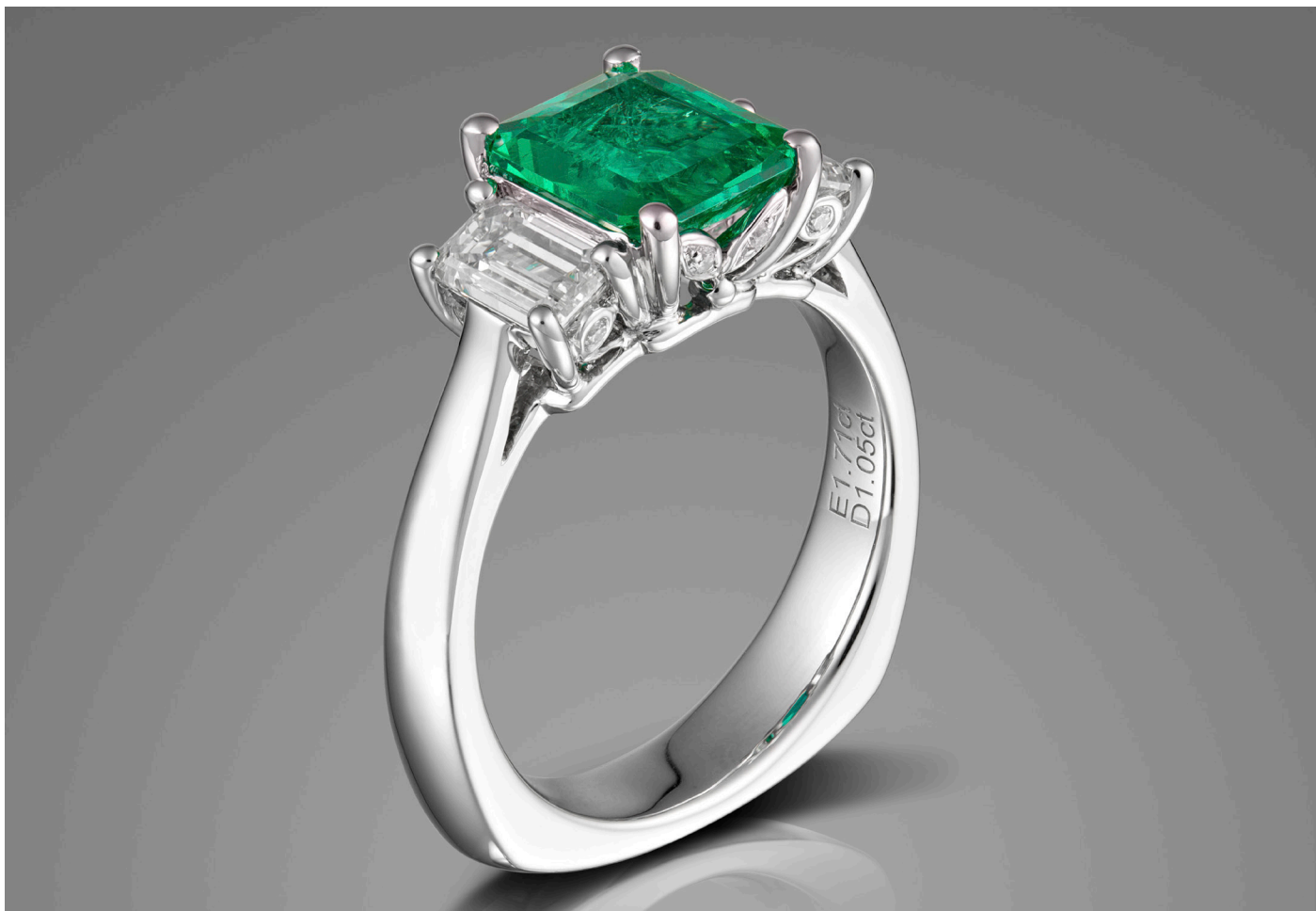
Ethiopian Opal (8.64 carats) (Photo by Jeff Mason)



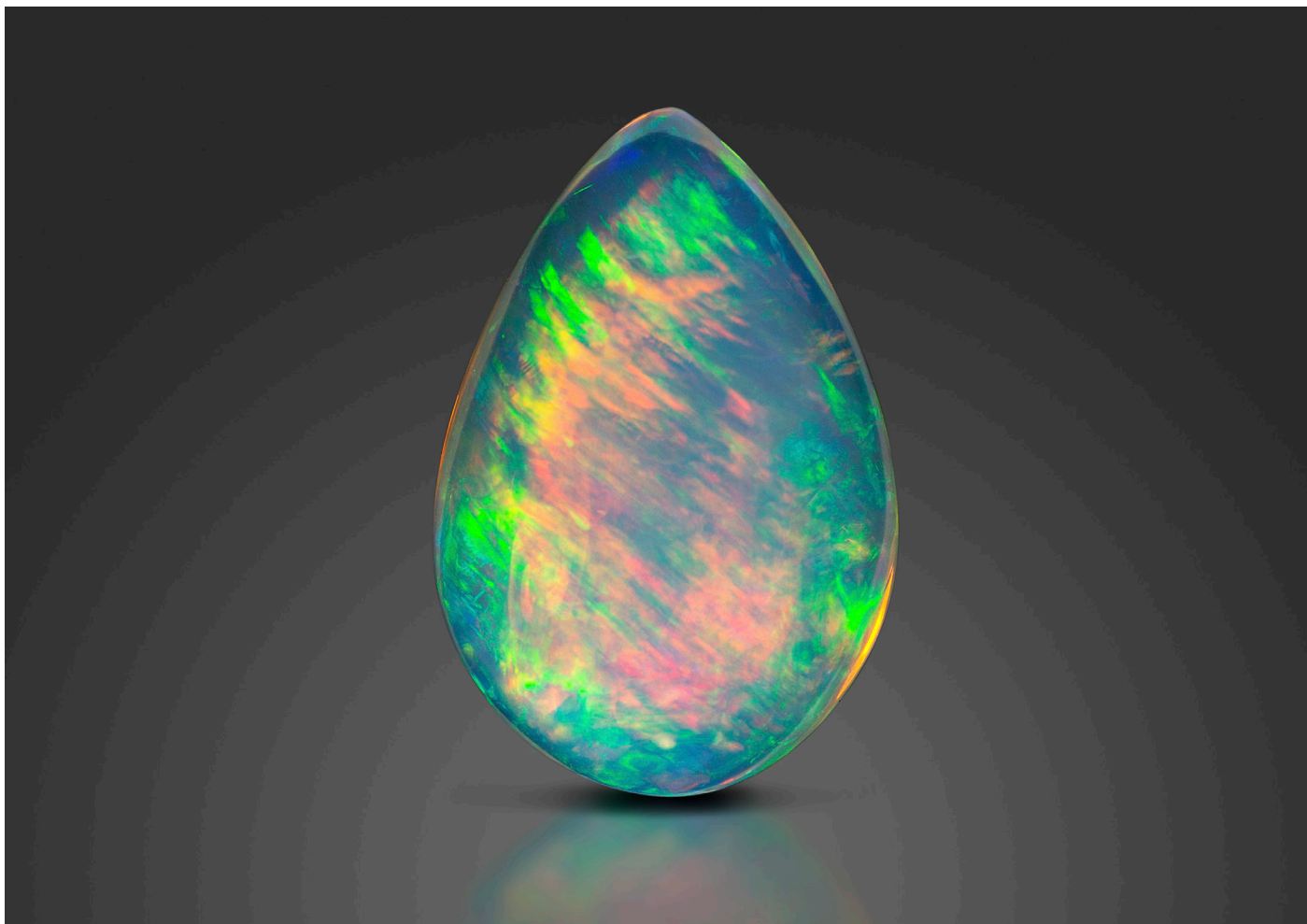
Burmese Peridot (5.78 carats) (Photo by Jeff Mason)



Australian Opal and Diamond Ring (8.25 carats) (Photo by Jeff Mason)



Natural Emerald and Diamond Ring (1.71 carat) (Photo by Jeff Mason)



Ethiopian Opal (8.64 carats) (Photo by Jeff Mason)



Ethiopian Opal and Diamond Ring (5.88 carats) (Photo by Jeff Mason)



Moonstone and Diamond Ring (15.58 carats) (Photo by Jeff Mason)



Tsavorite Garnet and Diamond Ring (8.54 carat) (Photo by Jeff Mason)



Natural Ruby and Diamond Ring (2.15 carats) (Photo by Jeff Mason)



Blue/Green 'Paraíba-like' Tourmaline and Diamond Ring (3.97 carats) (Photo by Jeff Mason)



Purple Sapphire and Diamond Ring (6.03 carats) (Photo by Jeff Mason)



Red Spinel and Diamond Ring (3.23 carat) (Photo by Jeff Mason)

Tools of the TRADE

GEOFF DOMINY is an author, independent gemmologist and founder of the World Gem Foundation. He received his F.G.A through the Gemmological Association of Great Britain (Gem-A) in 1987 passing the diploma examinations with distinction.



Testing Times

The ASSURE Program (Diamond Producers Association)

The ASSURE Program has developed a universal standard to test the performance of Diamond Verification Instruments in a consistent manner.

A Diamond Verification Instrument (DVI) is a device used to separate and/or identify diamonds from synthetic diamonds. In the trade, they are also known as synthetic diamond screening or detection devices.

The ASSURE Program will deliver on-going testing of Diamond Verification Instruments to ensure the trade is fully informed of the relative performance of the Diamond Verification Instruments in the market. The instruments are rigorously tested in a transparent manner against a unique common sample and standard.

The Diamond Verification Instrument Standard, which details the methods and protocols used to conduct the tests, was developed by the professional standard house UL in collaboration with experts from FSBI TISNCM, GIA, GII, DBIS/IIDGR, NGTC, SSEF and WTOCD who formed the ASSURE Technical Committee.

Each instrument is placed into one of three categories:

Category 1: this includes instruments that can separate diamonds from synthetic diamonds but cannot identify diamond simulants. Consequently, users of Category 1 instruments must pre-screen all stones to ensure there are no diamond simulants.

Category 2: this includes instruments that can separate natural diamonds from synthetic diamonds and diamond simulants. These instruments should be able to distinguish between a diamond simulant and a natural diamond. However, these instruments cannot distinguish between a diamond simulant and a synthetic diamond. The stones that have been categorised as 'non-natural diamond' will require further testing in order to determine whether they are diamond simulants or synthetic diamonds.

Category 3: this includes instruments that can separate diamonds, synthetic diamonds and diamond simulants. These instruments can separate synthetic diamonds from diamond simulants.

Testing

Each instrument is tested on the ASSURE Core Sample, a highly contaminated sample made up of loose natural and synthetic diamonds including very challenging synthetic diamonds, some of which are not yet available in the market. The ASSURE Sample will also evolve to include new synthetic diamonds as they are identified. When needed, 200 loose diamond simulants will be added to the sample.

The results of the tests are published in the ASSURE Directory. This directory contains the independent third-party verified performance test results for Diamond Verification Instruments participating in the program. The ASSURE directory will be regularly updated as new instruments are submitted for testing or re-testing.

The ASSURE samples contain natural diamonds with a controlled type I/II distribution, HPHT and CVD synthetic diamonds, some of which have received specialised treatments during and after the growth process and diamond simulants including cubic zirconia, foil backed glass crystals, synthetic moissanite and colourless synthetic corundum.

ASSURE Core Sample

The ASSURE Core Sample consists of round brilliant cut loose stones (larger than 2.00 mm in girdle diameter), in a range of colours (D to J) and clarities.

ASSURE Smalls Sample

The ASSURE Smalls Sample consists of round brilliant cut loose stones (measuring between 1.00 to 2.00 mm in girdle diameter), in a range of colours (D to J) and clarities.

Additional Testing Samples

Since many of the Diamond Verification Instruments possess capabilities that exceed the range of the ASSURE Core and Smalls Samples, ASSURE have developed additional samples including:

ASSURE Sample B: Loose stones larger than 2.00mm (girdle diameter), K-Z colour, round brilliant cut with mixed clarities.

ASSURE Sample D: Loose stones 1.00-2.00 mm (girdle diameter), K-Z colour, round brilliant cut with mixed clarities.

ASSURE Simple Jewellery: Open back jewellery set with D-J colour, round brilliant cut with mixed clarities.

ASSURE Intricate Jewellery: Closed back jewellery set with D-J colour, round brilliant cut with mixed clarities.

ASSURE Melee Jewellery: Open back jewellery set with D-J colour, round brilliant cut with mixed clarities.

Calculating Performance Metrics

The Diamond Verification Instruments sort the stones into different categories. All instruments have a 'natural diamond' category, and in addition, they either have specific 'synthetic diamond' and 'diamond simulant' categories, and/or a 'refer' category. The 'refer' category means that the nature of the stone is undetermined and must therefore be referred for further testing.

To calculate the performance metrics, the test technician determines the number of stones correctly and incorrectly sorted in each category.

For instruments that can only separate diamonds and synthetic diamonds (Category 1) there are six performance metrics. For instruments that separate diamonds from synthetic diamond and diamond simulants there is a greater number of performance metrics (Categories 2 and 3)

For an instrument that requires manual interpretation of the test results or needs to be operated by an expert to obtain the optimal performance of the instruments, the instrument is tested twice, once by a novice and once by a manufacturer appointed expert operator. The results of a novice operator are meant to be similar to the results of one who has recently purchased and begun using the instrument. The results for both the expert and novice operators are reported separately.

All instruments are evaluated on three key performance metrics:

Diamond False Positive Rate: This is the ratio of synthetic diamonds (and diamond simulants if applicable) erroneously classified as 'Natural Diamond' to the total number of synthetic diamonds (and diamond simulants). This is the fundamental measurement for the performance of the instrument. The optimal Diamond False Positive Rate is 0% where no synthetic diamonds (or diamond simulants) are classified as natural diamonds.

For example, if 2 out of the 200 synthetic diamonds were erroneously identified as natural diamonds, the rate would be 1%.

Diamond Referral Rate: This is the ratio of diamonds categorised as 'refer' or 'referral' to the total number of diamonds. A referral is a stone that cannot be classified by the Diamond Verification Instrument and requires further testing by a separate instrument or gemmological laboratory to determine whether the stone is a natural diamond, synthetic diamond, or where applicable a diamond simulant.

For example, if 100 out of 1,000 diamonds were categorised as refer, the Diamond Referral Rate would be 10%. This means that 100 diamonds would have to be subjected to further testing. The Diamond Referral Rate indicates how effectively the instrument classifies diamonds. The optimal Diamond Referral Rate is 0% where no diamonds are referred for further testing. Further testing entails not only additional testing time but also additional costs.

Diamond Accuracy: This is ratio of diamonds correctly categorised as diamond to the total number of diamonds. The optimal diamond accuracy is 100% where all diamonds are correctly classified as diamond.

Manufacturer Chosen Metric: Since each instrument may have unique capabilities, the manufacturer can choose a fourth performance metric from the list of performance metrics that have been evaluated by the ASSURE Test Process to allow for these differences.

Calculation Example

Test Stones: 1,000 natural diamonds and 200 synthetic diamonds.

Sorting: Sorted into two categories:

Diamonds: 902 stones (900 diamonds and 2 synthetic diamonds)

Refer: 298 stones (100 diamonds and 198 synthetic diamonds)

The Diamond False Positive Rate is 1% (2 synthetic diamonds out of 200 synthetic diamonds were classified as natural diamond).

The Diamond Accuracy Rate is 90% (900 out of the 1,000 natural diamonds were accurately categorised as natural diamond).

The Diamond Referral Rate is 10% (100 out of the 1,000 are undetermined and are therefore categorised as 'Refer').

Purchasing a Diamond Verification Instrument (DVI)

Before selecting an instrument to purchase, there are a number of factors that should be considered including the type of diamonds (size, colour, shape, and loose/mounted) to be tested, the quantity of the diamonds to be tested, the level of expertise of your staff, portability and budget.

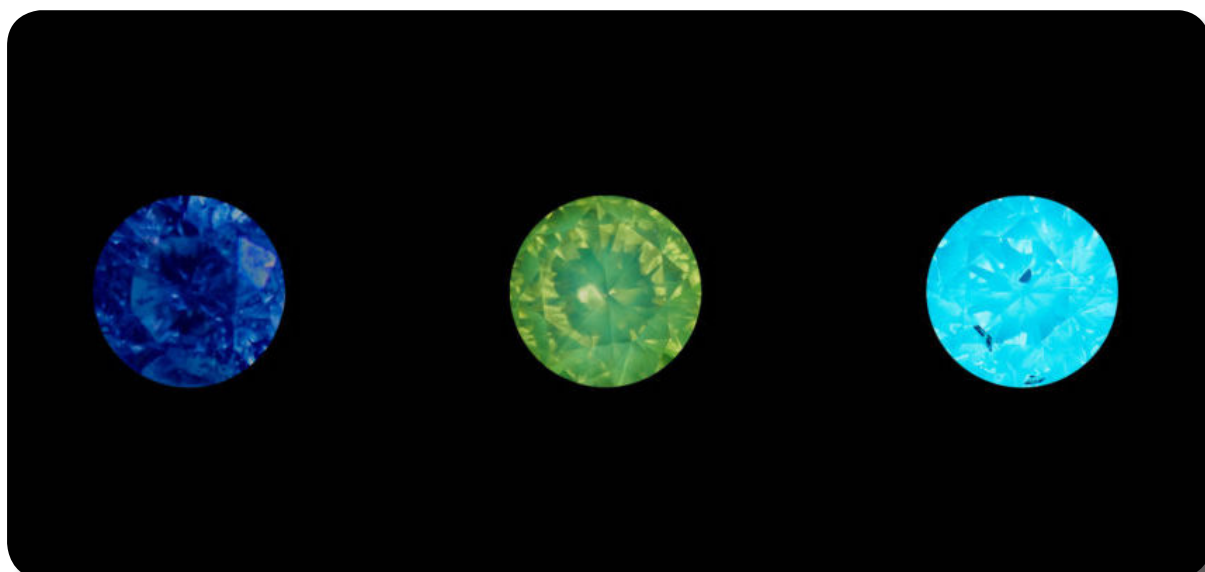
Selecting the right instrument for your needs is critical. A carpenter would never secure a screw with a hammer nor would he drive a nail into a piece of wood with a screwdriver. The same is true of gem testing equipment. Understanding what the instrument does, what principles it is based on, its strengths and its limitations is crucial.

It is important to appreciate that these instruments are designed and sold to 'screen' diamonds. A machine should never replace the 'human element' but at the same token, the proficiency of the 'human element' cannot be understated. While ASSURE include test results from 'novices', in reality, trusting an unqualified operator with the determination of a diamond's origin is dangerous. Mistakes can not only be financially crippling but can also be costly in terms of professional credibility and reputation resulting in losses that could far exceed the cost of any of these instruments. At the same token, it must be stressed that even if one instrument fulfills your needs, having more than one instrument at your disposal is important. The diamond industry is based on trust and that trust can easily be lost.

Test Stones

The 'Sample' sets listed below were used in the following tests by an 'Expert' tester:

Sample	Sizes	Colour	Natural Diamonds	Lab-created Diamonds	Simulants
Primary	> 2.00mm	D to J	748	150	148
Supp. Set A	> 2.00mm	D to J	249	-	-
Supp. Set AB	> 2.00mm	D to J	-	49	48
Supp. Set C	1.00mm a 2.00mm	D to J	737	140	145
Supp. Set D	1.00mm a 2.00mm	D to J	250	-	-
Supp. Set DE	1.00mm a 2.00mm	D to J	-	51	47



Untreated, treated and lab-created Diamonds using GemPen ® (Photo courtesy of Gemometrics AB)

ASSURE Certified Diamond Verification Instruments

Device	Manufacturer
Alrosa Diamond Inspector	Alrosa
AMS2	De Beers Group Industry Services (UK)
ASDI	SATT Gems (Switzerland)
D-Secure+	DRC Techno
DiamondDect 3	Taidiam Technology (Zhengzhou) Co. Ltd (China)
DiamondDect 5	Taidiam Technology (Zhengzhou) Co. Ltd (China)
DiamondSure	De Beers Group Industry Services (UK)
DiamondView	De Beers Group Industry Services (UK)
G-Certain	Massive Tech Lab (India)
Gemlogis VISTA	Gemlogis (Hong Kong)
GemPen	Gemometrics (Sweden)
GIA iD100	Gemological Institute of America (USA)
GV5000	National Gemstone Testing Center (China)
J-Certain	Massive Tech Lab (India)
J-Smart	DRC Techno
J.Detect 9000	DRC Techno
J.Mini	DRC Techno
M-Screen+	HRD Antwerp (Belgium)
QChKAdC	Arotek/GII
Sherlock Holmes	Yehuda Diamond Co. (USA)
SYNTHdetect	De Beers Group Industry Services (UK)
Synthetic Diamond Screener II	Presidium (Singapore)



The ASSURE TESTED Mark is exclusively available to ASSURE PARTNERS who have agreed to submit their instruments for testing by the ASSURE Testing programme. This provides an external assurance that the DVI has been tested by an independent third-party laboratory in accordance with the Diamond Instrument Verification Standard.

It is important to remember that the ASSURE TESTED mark certifies the test results, not the instrument and simply gives an assurance that the performance results are genuine.

While it is neither an endorsement of the instrument or the manufacturer, the voluntary submission of gem testing equipment, especially those capable of screening diamonds is an important development in the evolution of gemmology.

Diamond Verification Instruments (Category 1)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
DiamondDect 3	0.0	96.4	0.6	3.0	99.5	0.5	-	-	-
DiamondSure	0.0	95.3	4.7	0.0	-	100.0	-	-	-
DiamondView	0.0	100.0	0.0	0.0	100.0	0.0	-	-	-
Gemlogis VISTA	0.0	92.5	7.5	0.0	NA	100.0	NA	NA	NA
GIA iD100	0.0	96.7	3.3	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.5	-	2.5	100.0	0.0	-	-	-
Synthetic Diamond Screener II	0.0	84.5	15.5	0.0	-	100.0	-	-	-
J-Smart	10.6	88.0	NA	12.0	89.4	NA	-	-	-
QChKAdC	11.1	94.2	NA	5.8	88.9	NA	-	-	-
D-Secure+	14.1	94.7	NA	5.3	85.9	NA	NA	NA	NA
J.Detect 9000	14.6	81.4	18.6	0.0	NA	85.4	-	-	-
GemPen	15.1	98.7	-	1.3	84.9	-	-	-	-
J.Minor	15.6	93.9	NA	6.1	84.4	NA	-	-	-
G-Certain	17.6	99.7	0.2	0.1	69.3	13.1	-	-	-
DiamondDect 5	22.6	91.6	8.4	0.0	-	77.4	-	-	-

Diamond Verification Instruments (Category 2)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
ASDI	0.0	93.6	6.4	0.0	-	100.0	0.0	-	100.0
SYNTHdetect	0.0	99.3	0.7	0.0	-	100.0	0.0	-	100.0
GV5000	1.0	98.5	-	1.1	97.5	0.0	0.6	98.0	-

Diamond Verification Instruments (Category 3)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
Aloha Diamond Inspector	0.0	96.4	3.6	0.0	NA	100.0	0.0	100.0	0.0
AMS2	0.0	99.1	0.7	0.1	70.9	29.1	0.1	99.0	1.0
M-Screen+	0.0	95.9	4.1	0.0	-	100.0	0.0	-	100.0
J-Certain	19.6	99.7	0.2	0.1	67.3	13.1	-	-	-

The test results are based on the 'False/Positive Rate' for Natural Diamonds > 2.00mm in girdle diameter by Instrument Category Classification using Primary and A/AB Combined samples.

Diamond Verification Instruments (Category 1)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
GIA iD100	0.0	95.8	4.2	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.8	-	2.2	100.0	100.0	-	-	-
DiamondDect 3	1.0	90.6	4.0	5.5	99.0	0.0	-	-	-
J.Mini	1.6	77.0	NA	23.0	98.4	NA	-	-	-
D-Secure+	2.1	96.1	NA	3.9	97.9	NA	NA	NA	NA
QChKAdC	3.7	88.6	NA	11.4	96.3	NA	-	-	-
J.Detect 9000	3.7	90.3	9.7	0.0	NA	96.3	-	-	-
G-Certain	4.7	99.3	0.6	0.1	95.3	0.0	-	-	-
GemPen	4.7	99.5	-	0.5	95.3	-	-	-	-
J-Smart	4.7	96.8	NA	3.2	95.3	NA	-	-	-
DiamondDect 5	9.4	97.8	2.2	0.0	-	90.6	-	-	-
DiamondSure	-	-	-	-	-	-	-	-	-
DiamondView	-	-	-	-	-	-	-	-	-
Synthetic Diamond Screener II	-	-	-	-	-	-	-	-	-
Gemlogis VISTA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Diamond Verification Instruments (Category 2)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
ASDI	0.0	93.2	6.8	0.0	-	100.0	0.0	-	100.0
SYNTHdetect	0.0	98.1	1.9	0.0	-	-	-	-	-
GV5000	0.3	97.5	-	1.4	95.3	0.0	1.4	100.0	-

Diamond Verification Instruments (Category 3)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
AMS2	0.0	98.9	0.7	0.1	87.4	12.6	0.3	99.5	0.5
M-Screen+	0.0	90.9	9.1	0.0	-	100.0	0.0	-	100.0
J-Certain	5.8	99.3	0.3	0.4	93.7	0.5	-	-	-
Arosa Diamond Inspector	NA	NA	NA	NA	NA	NA	NA	NA	NA

The test results are based on the 'False/Positive Rate' for Natural Diamonds < 2.00mm in girdle diameter by Instrument Category Classification using C and D/DE Combined samples.

Diamond Verification Instruments (Portable)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
Alrosa Diamond Inspector	0.0	96.4	3.6	0.0	NA	100.0	0.0	100.0	0.0
DiamondDect 3	0.0	96.4	0.6	3.0	99.5	0.5	-	-	-
DiamondSure	0.0	95.3	4.7	0.0	-	100.0	-	-	-
Gemlogis VISTA	0.0	92.5	7.5	0.0	NA	100.0	NA	NA	NA
GIA iD100	0.0	96.7	3.3	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.5	-	2.5	100.0	0.0	-	-	-
Synthetic Diamond Screener II	0.0	84.5	15.5	0.0	-	100.0	-	-	-
GemPen	15.1	98.7	-	1.3	84.9	-	-	-	-

Diamond Verification Instruments (Non-Portable)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
AMS2	0.0	99.1	0.7	0.1	70.9	29.1	0.1	99.0	1.0
ASDI	0.0	93.6	6.4	0.0	-	100.0	0.0	-	100.0
DiamondView	0.0	100.0	0.0	0.0	100.0	0.0	-	-	-
M-Screen+	0.0	95.9	4.1	0.0	-	100.0	0.0	-	100.0
SYNTHdetect	0.0	99.3	0.7	0.0	-	100.0	0.0	-	100.0
GV5000	1.0	98.5	-	1.1	97.5	0.0	0.6	98.0	-
J-Smart	10.6	88.0	NA	12.0	89.4	NA	-	-	-
QChKAdC	11.1	94.2	NA	5.8	88.9	NA	-	-	-
D-Secure+	14.1	94.7	NA	5.3	85.9	NA	NA	NA	NA
J.Detect 9000	14.6	81.4	18.6	0.0	NA	85.4	-	-	-
J.Mini	15.6	93.9	NA	6.1	84.4	NA	-	-	-
G-Certain	17.6	99.7	0.2	0.1	69.3	13.1	-	-	-
J-Certain	19.6	99.7	0.2	0.1	67.3	13.1	-	-	-
DiamondDect 5	22.6	91.6	8.4	0.0	-	77.4	-	-	-

The test results are based on the 'False/Positive Rate' for Natural Diamonds > 2.00mm in girdle diameter for Diamond Verification Instruments using Primary and A/AB Combined samples.

Diamond Verification Instruments (Portable)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
GIA iD100	0.0	95.8	4.2	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.8	-	2.2	100.0	100.0	-	-	-
DiamondDect 3	1.0	90.6	4.0	5.5	99.0	0.0	-	-	-
GemPen	4.7	99.5	-	0.5	95.3	-	-	-	-
DiamondSure	-	-	-	-	-	-	-	-	-
Synthetic Diamond Screener II	-	-	-	-	-	-	-	-	-
Gemlogis VISTA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alrosa Diamond Inspector	NA	NA	NA	NA	NA	NA	NA	NA	NA

Diamond Verification Instruments (Non-Portable)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
AMS2	0.0	98.9	0.7	0.1	87.4	12.6	0.3	99.5	0.5
ASDI	0.0	93.2	6.8	0.0	-	100.0	0.0	-	100.0
M-Screen+	0.0	90.9	9.1	0.0	-	100.0	0.0	-	100.0
SYNTHdetect	0.0	98.1	1.9	0.0	-	-	-	-	-
GV5000	0.3	97.5	-	1.4	95.3	0.0	1.4	100.0	-
J.Mini	1.6	77.0	NA	23.0	98.4	NA	-	-	-
D-Secure+	2.1	96.1	NA	3.9	97.9	NA	NA	NA	NA
QChKAdC	3.7	88.6	NA	11.4	96.3	NA	-	-	-
J.Detect 9000	3.7	90.3	9.7	0.0	NA	96.3	-	-	-
G-Certain	4.7	99.3	0.6	0.1	95.3	0.0	-	-	-
J-Smart	4.7	96.8	NA	3.2	95.3	NA	-	-	-
J-Certain	5.8	99.3	0.3	0.4	93.7	0.5	-	-	-
DiamondDect 5	9.4	97.8	2.2	0.0	-	90.6	-	-	-
DiamondView	-	-	-	-	-	-	-	-	-

The test results are based on the 'False/Positive Rate' for Natural Diamonds < 2.00mm in girdle diameter for Diamond Verification Instruments using C and D/DE Combined samples.

Diamond Verification Instruments (under \$ 10,000 USD)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
Alrosa Diamond Inspector	0.0	96.4	3.6	0.0	NA	100.0	0.0	100.0	0.0
DiamondDect 3	0.0	96.4	0.6	3.0	99.5	0.5	-	-	-
Gemlogis VISTA	0.0	92.5	7.5	0.0	NA	100.0	NA	NA	NA
GIA iD100	0.0	96.7	3.3	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.5	-	2.5	100.0	0.0	-	-	-
Synthetic Diamond Screener II	0.0	84.5	15.5	0.0	-	100.0	-	-	-
QChKAdC	11.1	94.2	NA	5.8	88.9	NA	-	-	-
J.Detect 9000	14.6	81.4	18.6	0.0	NA	85.4	-	-	-
GemPen	15.1	98.7	-	1.3	84.9	-	-	-	-
J.Mini	15.6	93.9	NA	6.1	84.4	NA	-	-	-
G-Certain	17.6	99.7	0.2	0.1	69.3	13.1	-	-	-
DiamondDect 5	22.6	91.6	8.4	0.0	-	77.4	-	-	-

Diamond Verification Instruments (over \$ 10,000 USD)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
AMS2 (d)	0.0	99.1	0.7	0.1	70.9	29.1	0.1	99.0	1.0
DiamondSure (b)	0.0	95.3	4.7	0.0	-	100.0	-	-	-
DiamondView (d)	0.0	100.0	0.0	0.0	100.0	0.0	-	-	-
M-Screen+ (d)	0.0	95.9	4.1	0.0	-	100.0	0.0	-	100.0
SYNTHdetect (b)	0.0	99.3	0.7	0.0	-	100.0	0.0	-	100.0
GV5000 (d)	1.0	98.5	-	1.1	97.5	0.0	0.6	98.0	-
D-Secure+ (a)	14.1	94.7	NA	5.3	85.9	NA	NA	NA	NA
J-Smart (c)	10.6	88.0	NA	12.0	89.4	NA	-	-	-
J-Certain (a)	19.6	99.7	0.2	0.1	67.3	13.1	-	-	-

The test results are based on the 'False/Positive Rate' for Natural Diamonds > 2.00mm in girdle diameter for Diamond Verification Instruments based on price using Primary and A/AB Combined samples.

Price Ranges:

- under \$ 14,999 USD (a)
- \$ 15,000 to \$ 19,999 USD (b)
- \$ 20,000 to \$ 29,999 USD (c)
- \$ 30,000 to \$ 63,000 USD (d)

Please Note: ASDI by SATT GEMS did not list the price of their device

Diamond Verification Instruments (under \$ 10,000 USD)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
GIA iD100	0.0	95.8	4.2	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.8	-	2.2	100.0	100.0	-	-	-
DiamondDect 3	1.0	90.6	4.0	5.5	99.0	0.0	-	-	-
J.Min	1.6	77.0	NA	23.0	98.4	NA	-	-	-
QChKAdC	3.7	88.6	NA	11.4	96.3	NA	-	-	-
J.Detect 9000	3.7	90.3	9.7	0.0	NA	96.3	-	-	-
G-Certain	4.7	99.3	0.6	0.1	95.3	0.0	-	-	-
GemPen	4.7	99.5	-	0.5	95.3	-	-	-	-
DiamondDect 5	9.4	97.8	2.2	0.0	-	90.6	-	-	-
Synthetic Diamond Screener II	-	-	-	-	-	-	-	-	-
Gemlogis VISTA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alrosa Diamond Inspector	NA	NA	NA	NA	NA	NA	NA	NA	NA

Diamond Verification Instruments (over \$ 10,000 USD)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
AMS2 (d)	0.0	98.9	0.7	0.1	87.4	12.6	0.3	99.5	0.5
M-Screen+ (d)	0.0	90.9	9.1	0.0	-	100.0	0.0	-	100.0
SYNTHdetect (b)	0.0	98.1	1.9	0.0	-	-	-	-	-
GV5000 (d)	0.3	97.5	-	1.4	95.3	0.0	1.4	100.0	-
D-Secure+ (a)	2.1	96.1	NA	3.9	97.9	NA	NA	NA	NA
J-Smart (c)	4.7	96.8	NA	3.2	95.3	NA	-	-	-
J-Certain (a)	5.8	99.3	0.3	0.4	93.7	0.5	-	-	-
DiamondSure (b)	-	-	-	-	-	-	-	-	-
DiamondView (d)	-	-	-	-	-	-	-	-	-

The test results are based on the 'False/Positive Rate' for Natural Diamonds < 2.00mm in girdle diameter for Diamond Verification Instruments based on price using C and D/DE Combined samples.

Price Ranges:

- under \$ 14,999 USD (a)
- \$ 15,000 to \$ 19,999 USD (b)
- \$ 20,000 to \$ 29,999 USD (c)
- \$ 30,000 to \$ 63,000 USD (d)

Please Note: ASDI by SATT GEMS did not list the price of their device

Diamond Verification Instruments (Overview)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
Alrosa Diamond Inspector	0.0	96.4	3.6	0.0	NA	100.0	0.0	100.0	0.0
AMS2	0.0	99.1	0.7	0.1	70.9	29.1	0.1	99.0	1.0
ASDI	0.0	93.6	6.4	0.0	-	100.0	0.0	-	100.0
DiamondDect 3	0.0	96.4	0.6	3.0	99.5	0.5	-	-	-
DiamondSure	0.0	95.3	4.7	0.0	-	100.0	-	-	-
DiamondView	0.0	100.0	0.0	0.0	100.0	0.0	-	-	-
Gemlogis VISTA	0.0	92.5	7.5	0.0	NA	100.0	NA	NA	NA
GIA iD100	0.0	96.7	3.3	0.0	-	100.0	0.0	-	100.0
M-Screen+	0.0	95.9	4.1	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.5	-	2.5	100.0	0.0	-	-	-
SYNTHdetect	0.0	99.3	0.7	0.0	-	100.0	0.0	-	100.0
Synthetic Diamond Screener II	0.0	84.5	15.5	0.0	-	100.0	-	-	-
GV5000	1.0	98.5	-	1.1	97.5	0.0	0.6	98.0	-
J-Smart	10.6	88.0	NA	12.0	89.4	NA	-	-	-
QChKAdC	11.1	94.2	NA	5.8	88.9	NA	-	-	-
D-Secure+	14.1	94.7	NA	5.3	85.9	NA	NA	NA	NA
J.Detect 9000	14.6	81.4	18.6	0.0	NA	85.4	-	-	-
GemPen	15.1	98.7	-	1.3	84.9	-	-	-	-
J.Mini	15.6	93.9	NA	6.1	84.4	NA	-	-	-
G-Certain	17.6	99.7	0.2	0.1	69.3	13.1	-	-	-
J-Certain	19.6	99.7	0.2	0.1	67.3	13.1	-	-	-
DiamondDect 5	22.6	91.6	8.4	0.0	-	77.4	-	-	-

The test results are based on the 'False/Positive Rate' for Natural Diamonds > 2.00mm in girdle diameter by Diamond Verification Instrument using Primary and A/AB Combined samples.



Diamond Verification Instruments (Overview)

	Natural Diamonds			Lab-created Diamonds			Simulant		
	False/ Positive Rate	Accuracy	Referral Rate	False/Positive Rate	Accuracy	Referral Rate	False/ Positive Rate	Accuracy	Referral Rate
AMS2	0.0	98.9	0.7	0.1	87.4	12.6	0.3	99.5	0.5
ASDI	0.0	93.2	6.8	0.0	-	100.0	0.0	-	100.0
GIA iD100	0.0	95.8	4.2	0.0	-	100.0	0.0	-	100.0
M-Screen+	0.0	90.9	9.1	0.0	-	100.0	0.0	-	100.0
Sherlock Holmes	0.0	97.8	-	2.2	100.0	100.0	-	-	-
SYNTHdetect	0.0	98.1	1.9	0.0	-	-	-	-	-
GV5000	0.3	97.5	-	1.4	95.3	0.0	1.4	100.0	-
DiamondDect 3	1.0	90.6	4.0	5.5	99.0	0.0	-	-	-
J.Mini	1.6	77.0	NA	23.0	98.4	NA	-	-	-
D-Secure+	2.1	96.1	NA	3.9	97.9	NA	NA	NA	NA
J.Detect 9000	3.7	90.3	9.7	0.0	NA	96.3	-	-	-
QChKAdC	3.7	88.6	NA	11.4	96.3	NA	-	-	-
G-Certain	4.7	99.3	0.6	0.1	95.3	0.0	-	-	-
GemPen	4.7	99.5	-	0.5	95.3	-	-	-	-
J-Smart	4.7	96.8	NA	3.2	95.3	NA	-	-	-
J-Certain	5.8	99.3	0.3	0.4	93.7	0.5	-	-	-
DiamondDect 5	9.4	97.8	2.2	0.0	-	90.6	-	-	-
Synthetic Diamond Screener II	-	-	-	-	-	-	-	-	-
DiamondSure	-	-	-	-	-	-	-	-	-
DiamondView	-	-	-	-	-	-	-	-	-
Gemlogis VISTA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alrosa Diamond Inspector	NA	NA	NA	NA	NA	NA	NA	NA	NA

The test results are based on the 'False/Positive Rate' for Natural Diamonds < 2.00mm in girdle diameter by Diamond Verification Instrument using C and D/DE Combined samples.



Diamond Verification Instruments

DVI	Portability	Category	Detects/Refers	Size	Colour Range	Shapes	Mounted Goods	Auto Feed/Dispense	Single/Multiple Tests
AMS2	Desktop	3	Detect	Melee	D to J	All	No	Auto	Multiple
ASDI	Floor	2	Refer	Melee	D to J	Round	No	Auto	Multiple
Alrosa Diamond Inspector	Portable	3	Detect	Melee to 10 cts	D to J	All	Yes *	Manual	Single
D-Secure+	Desktop	1	Detect	Any	D to K	All	Yes *	Manual	Multiple
DiamondDect 3	Portable	1	Detect	Melee to 10 cts	D to J	All	Yes *	Manual	Single
DiamondDect 5	Desktop	1	Refer	Melee to 10 cts	D to J	All	Yes *	Manual	Multiple
DiamondSure	Portable	1	Refer	Melee to 10 cts	D to J	All	Yes *	Manual	Single
DiamondView	Desktop	1	Detect	Melee to 10 cts	All	All	Yes *	Manual	Single
G-Certain	Desktop	1	Detect	Melee to 10 cts	D to Z	All	Yes *	Manual	Multiple
Gemlogis VISTA	Portable	1	Refer	Melee to 12 cts	D to J	All	Yes *	Manual	Single
GemPen	Portable	1	Detect	Any	D to Z	All	Yes *	Manual	Multiple
GIA iD100	Portable	1	Refer	Any	D to J	All	Yes *	Manual	Single
GV5000	Desktop	2	Detect	Melee to 20 cts	D to N	All	Yes *	Manual	Multiple
J-Certain	Desktop	3	Detect	Melee to 10 cts	D to Z	All	Yes *	Manual	Multiple
J-Smart	Desktop	1	Detect	Any	D to K	All	Yes *	Manual	Multiple
J.Detect 9000	Desktop	1	Refer	Any	D to K	All	Yes *	Manual	Multiple
J.Mini	Desktop	1	Detect	Any	D to K	All	Yes *	Manual	Multiple
M-Screen+	Desktop	3	Refer	Melee	D to J	Round	No	Auto	Multiple
QChKAdC	Desktop	1	Detect	Melee to .20 cts	D to J	All	Yes *	Manual	Multiple
Sherlock Holmes	Portable	1	Detect	Any	D to K	All	Yes *	Manual	Multiple
SYNTHdetect	Desktop	2	Refer	Melee to 100 cts	D to J	All	Yes *	Manual	Multiple
Synthetic Diamond Screener II	Portable	1	Refer	Melee to 10 cts	D to J	All	Yes *	Manual	Single

** Note that this has not yet been tested by the ASSURE program*

The chart outlines the various features of each Diamond Verification Instrument certified through the ASSURE Program.





Alrosa Diamond Inspector



AMS2



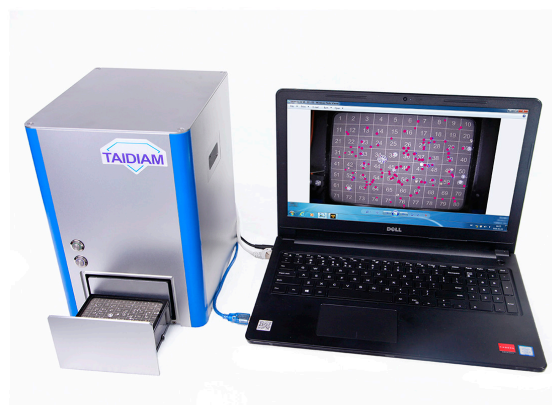
ASDI



D-Secure+



DiamondDect 3



DiamondDect 5



DiamondSure



DiamondView



G-Certain



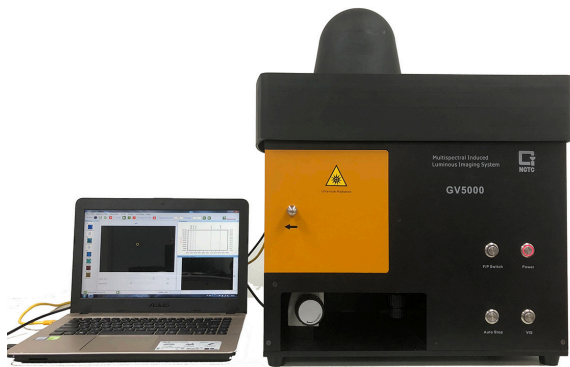
Gemlogis VISTA



GemPen



DiamondView



GV5000



J-Certain



J-Smart



J.Detect 9000



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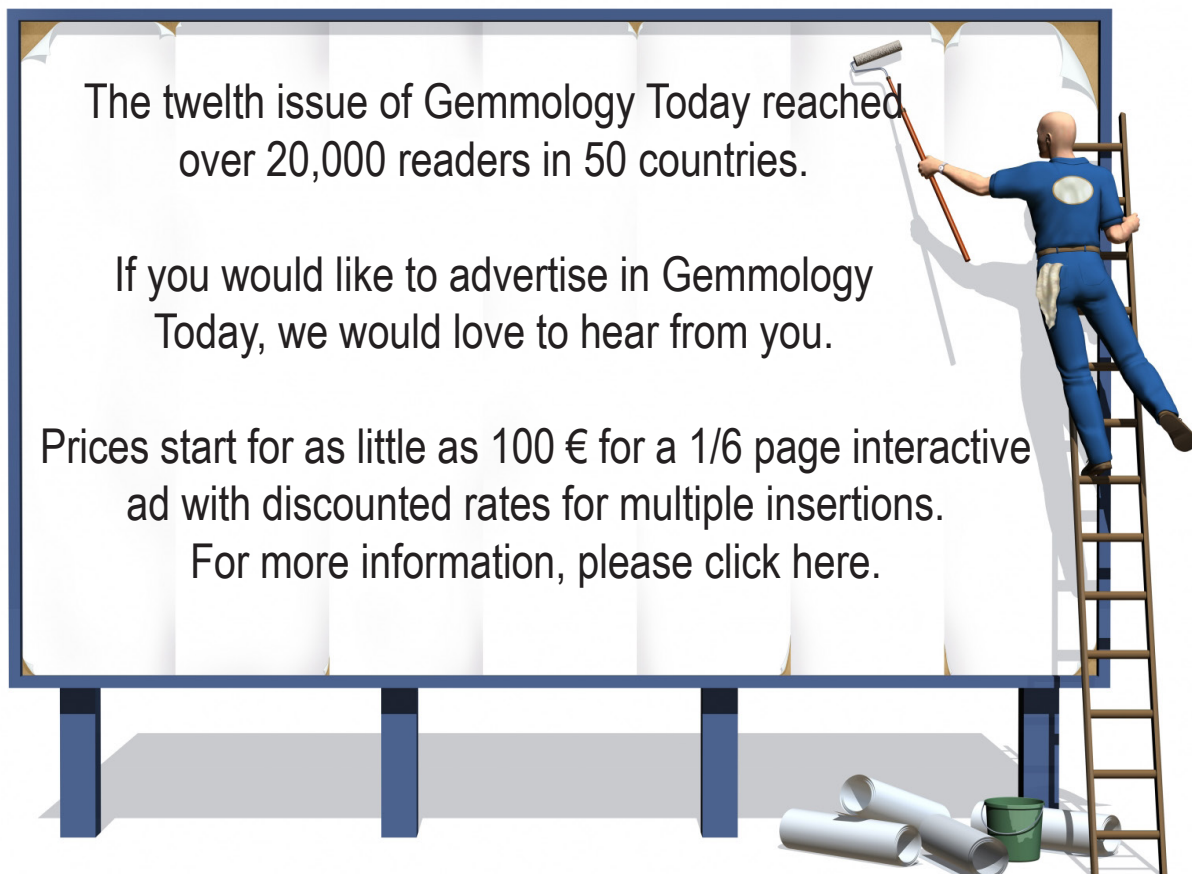
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Kirk Feral sheds light on a beautiful type of Pyrope Garnet unfamiliar to most gemmologists..."



Pastel Pyrope: A New Garnet Variety?

When we think of garnets, particularly pyrope garnets, we're likely to picture dark red gems. But there are a number of varieties within the pyrope species, and not all varieties are dark nor red in color. Pastel pyrope is a rare and often beautiful type of pyrope found in a number of light colors that aren't typical for pyrope. Remarkably, these garnets are mostly unfamiliar to gemologists, and they are not yet recognized as a distinct variety by any gemological institution.

Pastel pyrope gems are found in pastel pink, purple, maroon and pure red colors. Especially rare examples can be orange or yellow. Some pastel pyropes also show color change from daylight to incandescent light, and others fluoresce under longwave UV light. These garnets often contain rutile needle inclusions, which is a common feature within the pyrope species. All pastel pyrope gems that I've examined come from Tanzania, Madagascar and Sri Lanka, but gems from other locations may yet be found.



Because most gem dealers have never heard of the term 'pastel pyrope', they frequently categorize these pyropes along with other unusual-looking garnets as malaya garnets. But the chemical composition of pastel pyrope is quite unique. Pastel pyrope contains significantly more magnesium (from pyrope) and less iron (from almandine) than malaya garnet and most other varieties of pyrope.

The first use of the term 'pastel pyrope' goes back to 1988 when Dr. Carol Stockton published a brief article titled

'Pastel Pyropes' in the Notes and New Techniques section of the Summer edition of *Gems and Gemology* journal. In this first look at pyropes from East Africa that show unusually light colors, Stockton used only a refractometer and spectroscope to investigate and describe these garnets, comparing and contrasting them to light-colored grossular garnets.

Incredibly, after 1988 no one else published any further research or information about pastel pyropes. Intrigued and curious to learn more about these elusive garnets, I embarked on my own study. Since 2010, I've acquired and studied 38 examples of pastel pyrope gems and established some basic parameters for their identification. A summary of the results of my study are presented here, with more information available on my website gemstonemagnetism.com (see references).

Searching for Pastel Pyropes

Pastel pyrope gems are quite difficult to find, not only because they are rare, but also because they are never sold by that name. All pastel pyropes collected for my study were sold to me as rhodolite, malaya, umbalite, color change or grossular garnet. One yellow pastel pyrope I found was sold as an imperial hessonite.

In the photo below, purple gems in the back row were purchased as rhodolite garnets, pink gems in the middle row were purchased as pink malaya garnets, and reddish gems in the front row were purchased as imperial malaya garnets.



Once acquired, I was initially able to distinguish pastel pyrope gems from other types of garnets by testing their refractive index (R.I.) and magnetic response to an N52 neodymium magnetic wand. When we're trying to identify garnets, a magnetic wand is a more useful tool than the hand-held spectroscope that Stockton used in her original investigation of pastel pyropes.

I was able to analyze these gems further by determining the chemical composition of each pastel pyrope gem using the RIMS method (Refractive Index, Magnetic Susceptibility), a simple and elegant method developed by Dr. Don Hoover et al. in 2008. This method involves graphing refractive index in relation to magnetic susceptibility.

The precise degree of magnetic attraction shown by a garnet can be measured as magnetic susceptibility with a Hoover magnetic susceptibility balance. The composition of a pastel pyrope or any other garnet can then be determined in terms of percentages of the garnet's 3 primary garnet end-members. In the case of pastel pyrope, the end-members are pyrope, almandine and spessartine.

Defining Pastel Pyrope

Garnet species blend with each other in an endless array of varying proportions and color variations, with no real boundaries between one type of garnet and another. To make meaningful distinctions between all these variations, gemologists separate garnet species into varieties based on chemical composition and physical appearance. The question at hand is whether 'pastel pyrope' is just a handy term to describe light-colored pyrope gems, or does the term represent a distinct variety of garnet?

The color and chemical composition of pastel pyropes is continuous with that of other pyrope varieties such as malaya, rhodolite and color change garnet, and we could simply view pastel pyrope garnets as extreme examples of these other established varieties. But there is compelling evidence that the chemical composition of pastel pyrope is distinctive enough to warrant recognition as a separate variety with its own identifying characteristics.

Pastel pyropes are some of the purest transparent pyropes on earth, meaning they have unusually high pyrope content, low almandine content and low spessartine content. The unique identification parameters that I've found for pastel pyropes are:

1. Low color saturation that is lighter than typical pyropes.
2. Low refractive index range: R.I. 1.723 - 1.745
3. Drag response to an N52 neodymium magnet.
4. Low magnetic susceptibility range: SI $6.20 - 12.50 \times 10^{-4}$
5. High pyrope content range (74% - 87% pyrope based on RIMS calculations)



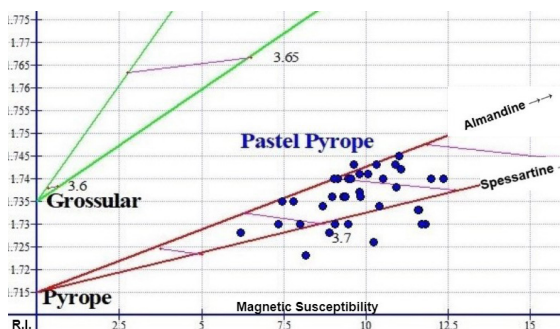
Most pastel pyrope gems weighing between 1 and 4 carats show only a drag response to an N52 magnet, a reaction that separates them from all other pyralspite garnets (pyrope, almandine and spessartine varieties), which show a pick-up response except for chrome pyrope. As with pastel pyrope, chrome pyropes are among the least magnetic of all pyrope varieties because the iron content is especially low and the magnesium content is especially high. Magnesium within gems doesn't cause magnetic attraction.

Pastel pyropes may look similar to certain light-colored malaya garnets, rhodolite garnets and color change garnets, but these other varieties have different identifying characteristics. They can be distinguished from pastel pyropes by their higher refractive index and higher magnetic susceptibility.

Pastel pyropes have the lowest refractive index range of any transparent garnet. The only gem garnet of any species or variety with a lower refractive index is hydrogrossular, which is a translucent to opaque variety of grossular garnet. The lowest R.I. for a pastel pyrope that I've measured is 1.723, and the highest is 1.745. Compare this to standard red pyrope gems, which have an average refractive index of approximately 1.755.

The percentage of pyrope content that I've calculated for pastel pyrope using the RIMS method averages 81% pyrope, with the remaining percentages made up of almandine and spessartine, along with a lesser amount of grossular garnet and tiny amounts of other garnet species. In contrast, the average percentage of pyrope that I've calculated for standard red pyropes is only about 68%, with the remainder composed mostly of almandine. These calculated percentages of pyrope are somewhat higher than actual percentages, as any grossular content that may be present in these pyropes is not included in the calculations.

Graph points on a RIMS graph for pastel pyropes occupy a unique section of the ternary graph, approaching the pure pyrope end-member. This section is unpopulated by any other garnet variety, neatly demonstrating that the chemical composition of pastel pyropes is rather distinct from other



garnets. Above is a RIMS graph showing blue graph points for 38 pastel pyrope gems.

In 2015, three staff gemologists at GIA conducted a study on a number of samples of purple-pink pyrope that were reportedly mined in Tanzania in 1988. The samples were provided to GIA by several gem dealers and cutters who had recently purchased the garnets from a parcel of rough stones. My own analysis of several samples from this same lot established that these are clear examples of pastel pyrope composed primarily of pyrope, with the remainder consisting of roughly equal amounts of almandine and spessartine.



I was disappointed to find that the researchers at GIA did not recognize or identify these stones as pastel pyrope. Instead, they focused on the phenomenon of color change in these garnets, effectively down playing the significance of more fundamental characteristics such as especially low refractive index (R.I. 1.736) and unusual chemical composition. The remarkably low magnetic susceptibility of these garnets was overlooked entirely.

Subsequently in an article in *Gems & Gemology Journal* titled 'Vanadium and Chromium Bearing Pink Pyrope Garnet: Characterization and Quantitative Colorimetric Analysis', the GIA researchers provisionally described these unusual garnets as color change garnets. This emphasis on color change is unfortunate, as the identifying characteristics and composition of these garnets are quite different from typical color change pyrope-spessartines.

The chemical composition of the pyropes in the GIA study is much more comparable to other pastel pyropes I've tested, regardless of their color or color phenomena. Pastel pyropes of other colors generally don't exhibit color change from daylight to incandescent light.

Colors of Pastel Pyrope

We can group pastel pyropes into 6 different colors, but in reality these colors blend with each other to form innumerable intermediary hues and degrees of color intensity. Generally the greater the almandine (iron) content, the darker the gem and the redder the gem. As spessartine (manganese) content displaces almandine, pastel pyrope gems become lighter, and yellow or orange colors begin to influence the more dominant color of pink or red. I haven't encountered any light blue or light green pastel pyropes, but theoretically these colors might exist, just as blue and green color change pyropes and pyrope-spessartines occur in East Africa.

Purple: Perhaps the most beautiful color among pastel pyropes is pinkish purple or purplish pink. This delicate color tends to be lighter in saturation and more purple in hue than what is found in typical rhodolite garnet, which is another variety of pyrope that shows purple color. Due to chromium content, purple pastel pyropes can appear bright red under a Chelsea filter.

In addition, purple pastel pyrope gems show a limited color change from purple in daylight to pink in incandescent light. As a result of the emphasis that GIA regrettably placed on the color change aspect of purple pastel pyropes, the color change moniker was adopted. Gem dealers now sell these purple gems as color change garnets rather than as pastel pyropes, and published articles now refer to this pyrope as color change garnet.



Pink: Pastel pyrope gems with light pink color are stunning in appearance and rare to find, much rarer than light pink malaya garnets. Most light pink pastel pyropes derive pink color primarily from a trace amount of chromium. When manganese content is relatively high in these pink gems, the

color can be modified toward yellowish pink or orangey pink. The low magnetic susceptibility found in pink pastels is due primarily to manganese rather than to iron or to chromium.

Pink pastel pyropes usually fluoresce pink or red under longwave UV light due to chromium. Chromium fluorescence in pyrospite garnets is only possible when iron content is relatively low.



Yellow: One of the most unusual pastel pyropes that I was able to find has light yellow color (derived from manganese), with a hint of pink as a secondary color (derived from chromium). Although the gem is quite pale, it shows strong red chromium fluorescence under longwave UV light.

This example of yellow pastel pyrope was sold as an imperial hessonite garnet. With a refractive index of 1.733, it's easy to see how this gem can be mistaken for a light-colored hessonite. But hessonite is a variety of grossular garnet, an entirely different garnet species with a different chemical composition and considerably less magnetic susceptibility. This yellow pastel pyrope is approximately 76% pyrope and 24% spessartine in composition, with very little almandine content.



Orange: Only one gem with reddish orange color was found in my search for pastel pyropes. Due to its predominantly orange color, this pyrope can easily be mistaken for hessonite garnet. To make the distinction even more

challenging, the refractive index of this gem is 1.743, which falls just within the R.I. range for hessonite. But magnetism definitively separates these two garnet species. The measured magnetic susceptibility of this orange pastel pyrope is more than three times as high as that of any hessonite.



Red: The word 'pastel' implies light color, but pastel pyropes with red color can be moderately dark. The color is still lighter than what is seen in typical red pyropes, and more similar to the color of red malayas. However, red pastel pyrope gems have a lower refractive index and less iron than red malayas and most other red pyropes. Red pastel pyropes are in solid solution between pyrope and almandine garnet. The darker red color is evidently the result of greater iron (almandine) content relative to chromium and manganese (spessartine) content.

The chemical composition of red pastel pyrope is very similar to that of chrome pyrope. A key difference is the amount of chromium. The high concentration of chromium in chrome pyrope (approximately 4%-8% chromium oxide by weight)



far exceeds what is present in red pastel pyrope. The red color of chrome pyrope is also much darker than the color of red pastel pyrope.

Maroon: The color that I've encountered most frequently in pastel pyropes is a brownish red (maroon) or orangey red hue with moderate color saturation. These gems can look identical to the malaya garnets that gem dealers sometimes refer to as imperial malayas. But these pastel pyropes have a lower refractive index and lower magnetic susceptibility than their malaya counterparts.



The next time you come across a garnet that is surprisingly light in color or has an unconventional appearance, you can test it yourself with a refractometer and an N52 neodymium magnet. If you're lucky, the garnet might just turn out to be a rare pastel pyrope. Happy hunting!

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Article Submissions

The deadline for the next issue is

February 15th, 2020

Guidelines:

- We do not accept highly scientific articles. These are better suited for either the *Journal of Gemmology* or *Gems & Gemology*
- All articles should be a minimum of one page.
- All accompanying photographs must be high resolution.
- All photographs must be accompanied by written permission from the copyright holder unless the author owns the rights.
- Wherever possible please try to supply images from the same photographic source or one that are at least compatible with each other. This will ensure that the article is aesthetically pleasing as well as informative.
- We reserve the right to refuse articles

E-mail all submissions to:

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The World Gem Foundation is delighted to offer five more scholarships this year. These scholarships cover the theoretical components of our Career Gemmology Diploma Program.

Tino Hammid Memorial Gemmological Scholarship



In every industry there are iconic individuals, giants who stand head and shoulders above the rest. In the field of jewellery and gemstone photography, there is little debate that Tino Hammid was a visionary, a rare talent who possessed the unique ability to capture the true beauty of gemstones. For almost forty years his photography adorned the pages of every important publication around the world, showcasing his unrivalled ability to inject realism into his work.

Tino started his career as a staff gem photographer at the Gemological Institute of America (GIA) in Santa Monica, California (1980 to 1982). In 1983 he started his freelance career in gem and jewellery photography and began a 25-year association with David Federman providing photographs for Modern Jeweler's monthly Gem Profile column. During this period they jointly won two Jesse H. Neal awards from the Association of Business Publishers. In 1987 he acquired Christie's Auction house as a client and photographed more than a hundred of their jewellery sales catalogues. In 2012, Tino joined forces with gemmologist Geoffrey M. Dominy and provided the exquisite photographs for The Handbook of Gemmology, the first digitized gemmological textbook released in 2013.

Sadly, Tino passed away in 2015 after a two-year battle with cancer, however through the Handbook of Gemmology and now the World Gem Foundation courses, his legacy and monumental contribution to our industry will live on for future generations to appreciate and admire.

In 2020, the World Gem Foundation will award five scholarships allowing deserving students to take the World Gem Foundation theoretical 'Career Gemmology' course.

The deadline for submitting your application is December 31st, 2019. All applications will be judged by Tino's wife Petra and his oldest daughter Evelyn with the mandate to select those five candidates who, in their opinion, best epitomize the spirit of Tino.

To download the application form, please click on the image below:



Studying Gemmology with the World Gem Foundation

There's an expression 'different strokes for different folks' and this is certainly true in the case of gemmology. We are fortunate to work in an extremely diverse industry; one that provides unlimited opportunities in a broad range of disciplines.

Some people want to become a professional gemmologist; to forge a career for themselves working with gemstones. At the World Gem Foundation, gemmology is not just a job, it's a profession. This is why we opted for the 'Career Gemmologist' designation. We not only want to raise the level of consciousness with consumers but also within our industry. An awareness that gemmology is a science that demands a high level of theoretical knowledge and practical experience.

At the same token, we also understand that not everyone wants to become a fully fledged gemmologist. Many choose to specialise in a particular area, such as diamonds or coloured gemstones. To recognise this, we introduced two new 'Diploma' programs (Diamond Professional and Coloured Gemstone Professional) in 2018.

But what about gemmologists who may have completed their studies five, ten, fifteen or twenty years ago? Since gemmology is constantly evolving, it is important to continually upgrade your knowledge. You simply cannot afford to become complacent. One minute you may be 'up to speed', the next completely 'out of sync'. Each year brings new treatments and enhancements, new lab-created gemstones and new techniques to identify them. It is not the certificate that hangs on your wall that defines who you are as a gemmologist but the knowledge you possess. Our courses can be taken collectively or independent of each other, allowing our students to customise their own personal development programs based on their own specific needs.

Finally, there are many people who share a passion for gemstones but don't necessarily want to enrol in a gemmological program, they simply want to augment their existing knowledge and upgrade their level of understanding.

Regardless of your motivation to expand your knowledge, the World Gem Foundation has a variety of courses and programs that can help you reach your goal.

Career Gemmologist Program

For students wishing to pursue a career in gemmology, our 'Career Gemmologist' program has been especially designed to give you the knowledge and experience required to work as a professional gemmologist. The World Gem Foundation and our affiliated gem academies offer you two options to earn your Career Gemmologist Diploma with our Gemmology Seven/ Eleven programs.

Gemmology Seven

This option allows you to complete the entire theoretical requirements by enrolling in our Career Gemmology course (78 lessons) and completing the five practical workshops (Gem Identification #1, Gem Identification #2, Diamond Grading and Lab-created Diamonds, Coloured Gemstone Grading #1 and Lab-created and Treated Gems) and our 60 hour online Coloured Gemstone Grading course.

The theoretical component covers the chemical nature of gemstones, their physical and optical properties, basic crystallography, the absorption of light, the spectroscope, refraction and reflection, the refractometer, optical character and sign, dispersion, reflectivity meters, polarized light, the polariscope, pleochroism, the dichroscope, colour filters, specific gravity, luminescence, magnification and thermal conductivity.

From there we move into the most challenging and fluid areas of gemmology; imitation and composite gemstones, lab-created gemstones and the treatment and enhancement of gems.

In the lessons pertaining to lab-created gemstones you will not only learn about the various methods used to manufacture lab-created gemstones (including Verneuil Flame-Fusion, Czochralski Pulling Method, Flux Melt Method, the Hydrothermal Method, Skull Crucible, Zone Melt, Horizontally Oriented Crystallization, the Sublimation Method, and the Modified Stober Method) but also the unique identifying features that allow us to separate them from their natural counterparts.

The use of treatments and enhancements is both demanding and depending on who you talk to, highly controversial. Here we look at not only the techniques used to treat and enhance gemstones (heat treatment, surface and sub-surface diffusion, lead glass fracture filling, flux assisted partial fissure healing, glass fracture filling, cobalt doped glass filled sapphires, clarity enhanced diamonds, HPHT, quench-crackling, surface modifications, coatings and foil backs, laser drilling and irradiation) but also how they can be detected. We also look at the advanced gem testing techniques that are often needed to identify many of these treatments.

The course then takes a slightly different direction, focusing on the identification of gemstones including the tests that are commonly used to identify them and an in-depth look at each of the ten gemstone groupings based on colour and transparency (colourless or white, red, pink, orange,

yellow, blue, green, violet or purple, brown, black or grey). These lessons include the important varieties and species of gemstones that commonly occur within each colour grouping, how to distinguish gemstones that are commonly confused with each other (i.e. aquamarine and blue topaz, emerald and chrome green tourmaline, diamond and lab-created moissanite) or gemstones that have physical and optical properties that are similar (i.e. amethyst quartz and purple scapolite) to each other. This section also includes gemstones that either exhibit optical phenomena (i.e. asterism or chatoyancy) or are unusual by nature.

The next section looks specifically at diamonds, their physical properties, geology, localities, principle mines, crystal system, chemical composition and classification. You will also find lessons dedicated to fancy coloured diamonds, the causes of colour, absorption spectra, inclusions, fluorescence, mining, gem identification, methods of synthesis (including HPHT, CVD, Detonation and Ultrasonic Cavitation), common treatments and enhancements and a comprehensive examination of the 4 C's (colour, clarity, cut and carat weight) and how they are measured and assessed. The lesson on 'Cut' compares some of the most important and recognized 'Cut' grading systems used today including those pioneered by the Gemological Institute of America (GIA), the American Gem Society (AGS), Hoge Raad voor Diamant (HRD), the International Gemological Institute (IGI), the European Gemological Laboratory (EGL) and the Accredited Gem Appraisers (AGA).

The final twenty-nine lessons (29) are devoted to coloured gemstones and covers their physical properties, geology, localities, crystal system, chemical composition and causes of colour, varieties, absorption spectra, pleochroism, inclusions, fluorescence, gem identification, synthesis, common treatments and enhancements, and care guidelines. Gemstones covered include corundum, beryl, chrysoberyl, spinel, zircon, topaz, tourmaline, peridot, quartz, garnet, tanzanite, lapis lazuli, turquoise, spodumene, feldspars, iolite, andalusite, diopside, apatite, and organic gems (pearls, coral, jet, ivory, and amber). You will also learn about the various colour grading systems currently used (GIA, Gemewizard, GemDialogue and the World of Color) including how to accurately describe colour based on hue, tone and saturation, the clarity classification of gemstones, how cut is assessed, opal, jadeite and pearl grading, and how to estimate the weight of 'mounted' stones.

The study of gemmology simply would not be complete without a comprehensive program of practical instruction. This involves five practical workshops (Gem Identification #1 & #2, Diamond Grading and Lab-created Diamonds, Lab-created and Treated Gems and Coloured Gemstone Grading #1) totalling twenty-eight days of in-class instruction and a 60 hour online Coloured Gemstone Grading course where you will work with the Gemewizard Colour Grading system.

Gemmology Eleven

While the information is the same, the theoretical portion of this program is divided into five free-standing courses (Basic Gemmology, Advanced Gemmology, Gem Identification, Diamonds and Coloured Gemstones). This option allows you to take each course separately giving you greater flexibility in terms of time and how you can pay for the courses.

Like the 'Gemmology Seven' program, there are five practical workshops and one 60 hour online course.

Diamond Professional Program

Designed specifically for those engaged in the diamond trade, this program covers the same theoretical information covered in our 'Diamonds' course plus our eight-day Diamond Grading and Lab-created Workshop.

Coloured Gemstone Professional Program

If your area of expertise is coloured gemstones, this program is ideally suited for you. The CGP program involves the completion of four theoretical courses (Basic Gemmology, Advanced Gemmology, Gem Identification and Coloured Gemstones) plus our two five-day practical Gem Identification workshops, our five-day Coloured Gemstone Grading #1 workshop, our five-day Lab-created and Treated Gems workshop plus our 60 hour online Coloured Gemstone Grading #2 course.

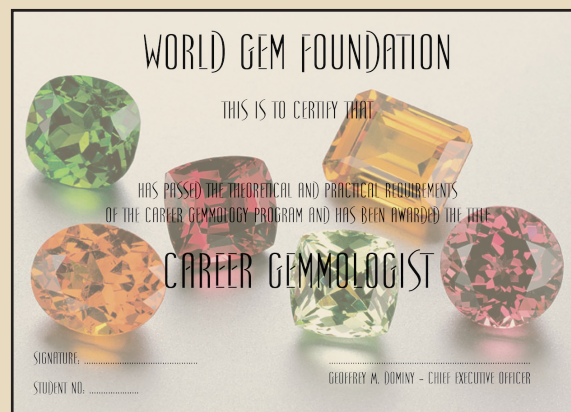
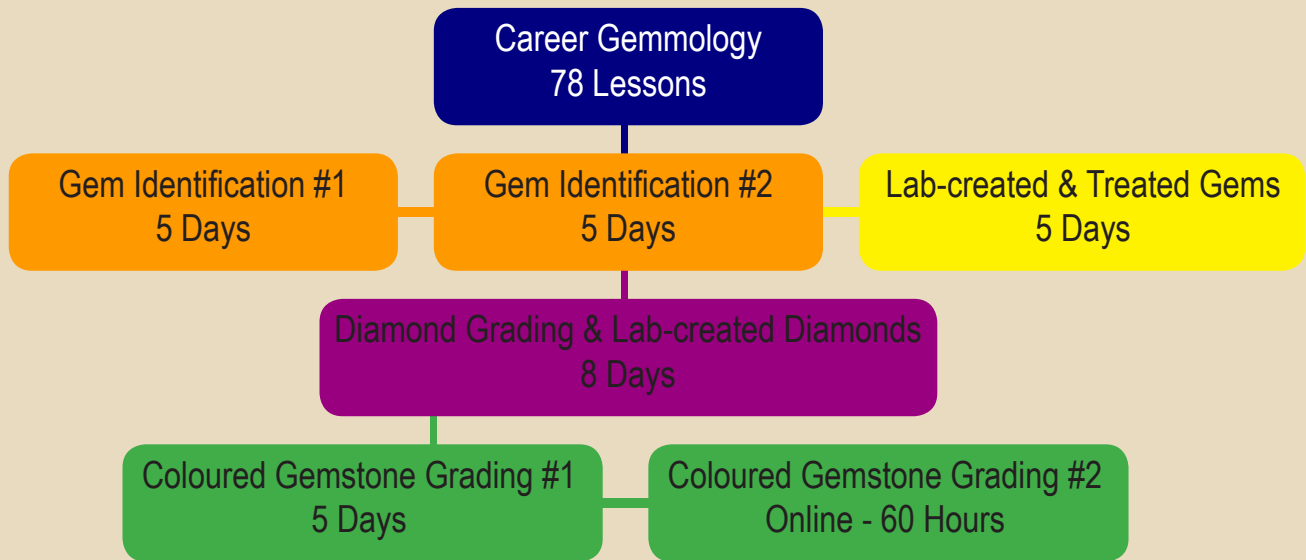
Courses in Other Languages

We are currently translating all of our 'Diploma' program courses into Spanish and French to meet the needs of our Spanish and French speaking students. At this time, Gemología Básica, Gemología Avanzada and Identificación de Gemas are available in Spanish while Gemmologie Fondamentale and Gemmologie Avancée are available in French.

General Interest Courses

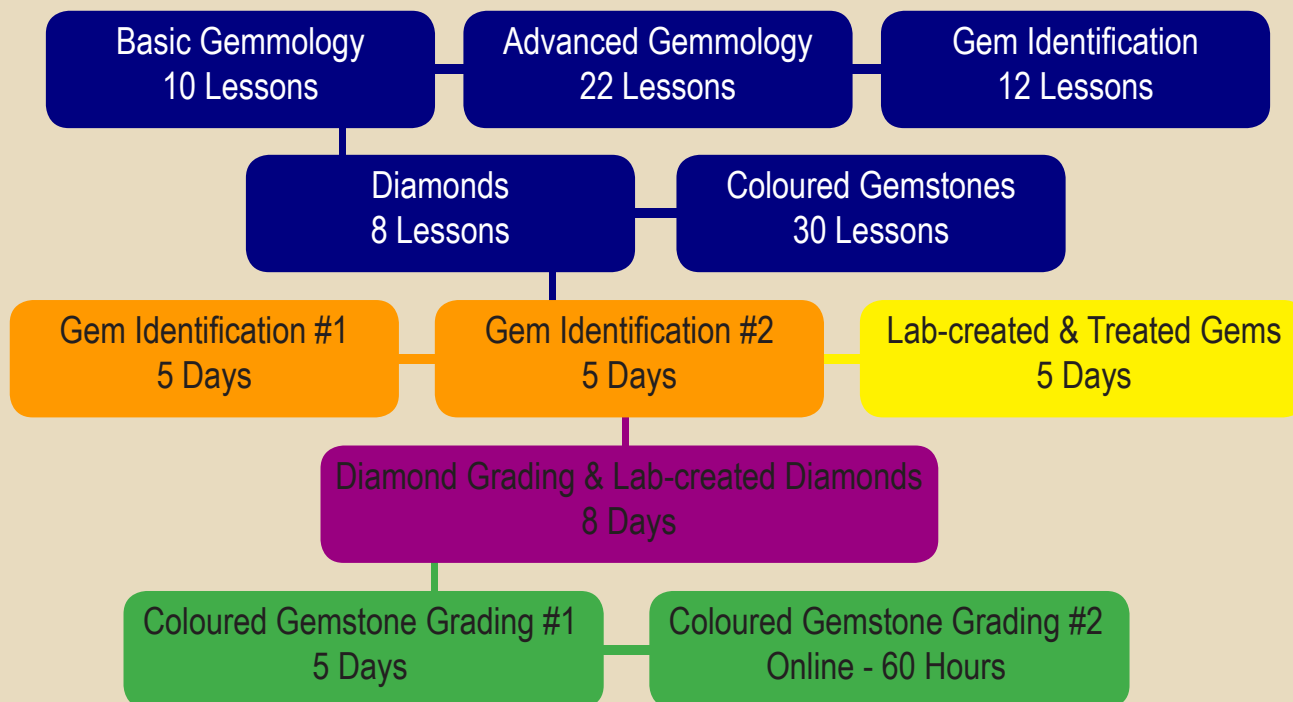
For those interested in gemstones but not wishing to take our 'Diploma' programs, all of our theory courses can be taken independently without prerequisites. In addition to the six theoretical courses (Career Gemmology, Basic Gemmology, Advanced Gemmology, Gem Identification, Diamonds and Coloured Gemstones) that make up our Career Gemmologist, Diamond Professional and Coloured Gemstone Professional 'Diploma' programs, we also offer three 'General Interest' courses (Rubies, Sapphires and Emeralds, Opals and Jade and Organic Gems).

GEMMOLOGY SEVEN PROGRAM



Career Gemmology Seven	Digital Fees			Printed Fees		
Course Name	Euros	Pounds Sterling	USD	Euros	Pounds Sterling	USD
Career Gemmology (Theory)	1400	1100	1600	1570	1235	1795
Gem Identification #1	500	400	550	500	400	550
Gem Identification #2	500	400	550	500	400	550
Coloured Gemstone Grading #1	500	400	550	500	400	550
Coloured Gemstone Grading #2	1000	800	1150	1000	800	1150
Diamond Grading/Lab-created Diamonds	1750	1400	2000	1750	1400	2000
Lab-created & Treated Gems	500	400	550	500	400	550
Examinations Fees (Final Exam)	250	200	280	250	200	280
Total Cost	6400	5100	7230	6570	5235	7425

GEMMOLOGY ELEVEN PROGRAM

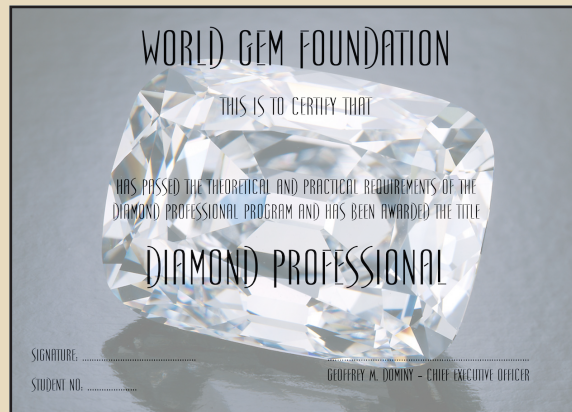


Career Gemmology Eleven		Digital Fees			Printed Fees		
Course Name	Euros	Pounds Sterling	USD	Euros	Pounds Sterling	USD	
Basic Gemmology (Theory)	200	150	225	235	180	265	
Advanced Gemmology (Theory)	400	300	450	430	325	485	
Gem Identification (Theory)	225	175	250	255	200	285	
Diamonds (Theory)	225	175	250	255	200	285	
Coloured Gemstones (Theory)	500	400	550	565	450	625	
Gem Identification #1	500	400	550	500	400	550	
Gem Identification #2	500	400	550	500	400	550	
Coloured Gemstone Grading #1	500	400	550	500	400	550	
Coloured Gemstone Grading #2	1000	800	1150	1000	800	1150	
Diamond Grading/Lab-created Diamonds	1750	1400	2000	1750	1400	2000	
Lab-created & Treated Gems	500	400	550	500	400	550	
Examinations Fees (Final Exam)	250	200	280	250	200	280	
Total Cost	6550	5200	7355	6740	5355	7575	

DIAMOND PROFESSIONAL

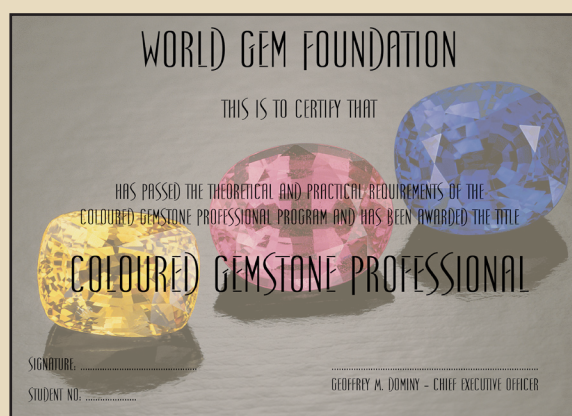
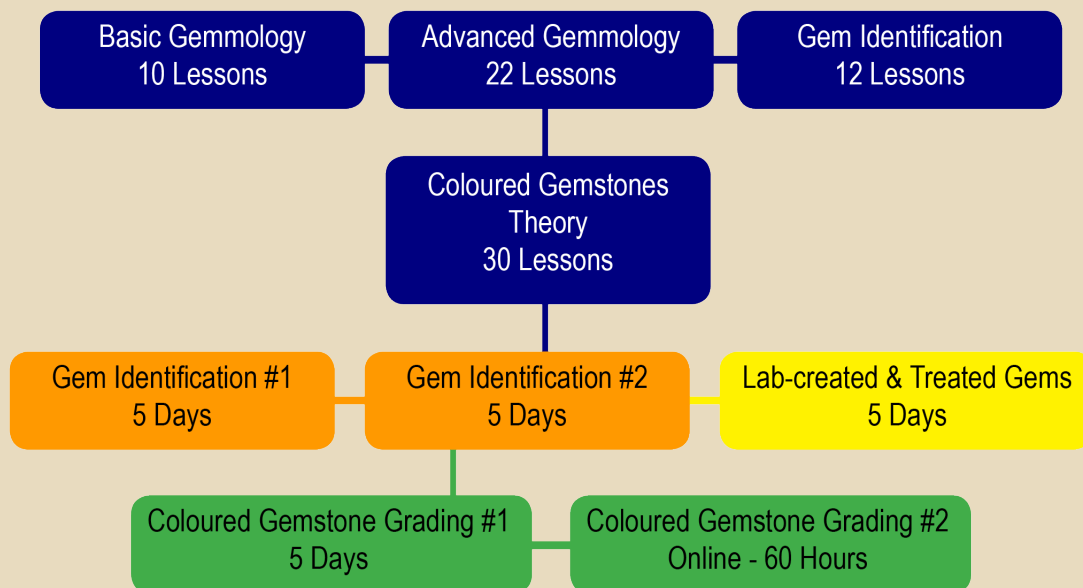
Diamonds
Theory
8 Lessons

Diamond Grading & Lab-created Diamonds
Practical Workshop
8 Days



Diamond Professional	Digital Fees			Printed Fees		
Course Name	Euros	Pounds Sterling	USD	Euros	Pounds Sterling	USD
Diamonds (Theory)	225	175	250	255	200	285
Diamond Grading/Lab-created Diamonds	1750	1400	2000	1750	1400	2000
Examinations Fees (Final Exam)	250	200	280	250	200	280
Total Cost	2225	1775	2530	2255	1800	2565

COLOURED GEMSTONE PROFESSIONAL



Coloured Gemstone Professional

Digital Fees

Printed Fees

Course Name	Euros	Pounds Sterling	USD	Euros	Pounds Sterling	USD
Basic Gemmology (Theory)	200	150	225	235	180	265
Advanced Gemmology (Theory)	400	300	450	430	325	485
Gem Identification (Theory)	225	175	250	255	200	285
Coloured Gemstones (Theory)	500	400	550	565	450	625
Gem Identification #1	500	400	550	500	400	550
Gem Identification #2	500	400	550	500	400	550
Coloured Gemstone Grading #1	500	400	550	500	400	550
Coloured Gemstone Grading #2	1000	800	1150	1000	800	1150
Lab-created & Treated Gems	500	400	550	500	400	550
Examinations Fees (Final Exam)	250	200	280	250	200	280
Total Cost	4575	3625	5105	4735	3755	5290

Rubies, Sapphires & Emeralds

This course focuses on three coloured gemstones (rubies, sapphires and emeralds) that individually and collectively are considered the cornerstones of the coloured gemstone trade. Lessons include a complete overview of their physical and optical properties, principal sources, mining, how they can be identified from gemstones that can be deceptively similar in appearance and their lab-created counterparts, common treatments and enhancements, pricing guidelines, what constitutes the best quality and how to properly care for them.

Opals and Jade

This course looks at two of the most fascinating and complex gemstones in the science of gemmology. The lessons on opal cover their physical and optical properties, their geology, localities, crystal system, chemical composition and classification, varieties, cause of colour, absorption spectra and pleochroism, inclusions, fluorescence, principal mines, opal mining in Australia, opal grading, synthesis of opal, gem identification, common treatments and enhancements, opal doublets and triplets, cleaning and care and pricing.

The section on jade follows a similar format with lessons covering their physical and optical properties, their geology, localities, crystal system, chemical composition, absorption spectra and pleochroism, inclusions, fluorescence, mining, principal mines, evaluating the rough, jadeite cutting, jadeite nomenclature, grading jadeite, synthesis of jadeite, gem identification, common treatments and enhancements, cleaning and care and pricing.

Organic Gems

This course explores a very select group of gemstones (coral, jet, amber, ivory and pearls), formed through organic processes rather than through geological forces deep within the earth's surface. Lessons cover their physical and optical properties, geological formation, crystal systems, chemical composition, varieties and classification, causes of colour, common inclusions and internal characteristics, fluorescence, pearl grading criteria, methods of synthesis, gem identification, common treatments and enhancements, and cleaning and care instructions.

Online Tutoring

While clearly the ideal way to learn a particular subject is with one-on-one tutoring, we appreciate that this is difficult when you enrol in a long distance study program.

Fortunately, new distance learning technologies are changing. Now teachers can connect with their students virtually using a variety of virtual tutoring tools, such as Skype.

The chart below outlines the number of online tutoring hours that are included in your course price. If you require more online instructional tutoring, please contact your education coordinator to discuss availability and pricing.

Course Name	Hours
Basic Gemmology - Theory	2
Advanced Gemmology - Theory	4
Gem Identification - Theory	2
Diamonds - Theory	2
Coloured Gemstones - Theory	5
Career Gemmology - Theory	14

We strongly suggest that you contact your instructor beforehand by e-mail with your questions so that you will derive maximum benefit from your online session. Please remember that these sessions are designed to provide you with 'coaching' rather than direct instruction.

Once a Student, Always a Student

With our 'Once a student, always a student' policy, every WGF registered student receives lifetime access to their student page. So every time we update our courses, they get the latest version free of charge.

Why? Because at the WGF, we believe you should never stop learning.

Course Fees

Fees charged by the individual gem academies are charged in the prevailing currency for that particular area (i.e. Euros in Europe, Pounds Sterling in Britain). Please note that shipping charges apply to any courses provided in print.

2020 Workshops

Interested in taking one of our practical workshops in Europe in 2020? Click [here](#) to see the current schedule.

Practical Workshops

Gem Identification #1



Course Cost € 500

Reserve Your
Place Now

This five day (30 hour) practical workshop focuses on the study and identification of six colour groupings (colourless/white, red, pink, orange, yellow and green) and basic crystallography. Gemstones covered in this workshop include:

Natural Diamond, Natural Ruby, Natural Sapphire, Emerald, Beryl, Garnets (Spessartite, Almandite Rhodolite, Pyrope, Colour Change, Hessonite, Demantoid, Tsavorite and Grossular), Spinel, Tourmaline, Topaz, Beryl, Quartz, Zircon, Alexandrite, Chrysoberyl, Apatite, Kunzite, Sunstone, Sphalerite, Sphene, Phenakite, Brazilianite, Scapolite, Hiddenite, Danburite, Benitoite, Diaspore, Epidote, Kyanite, Idocrase, Sinhalite, Diopside, Kornerupine, Enstatite, Euclase, Andalusite, Ekanite, Idocrase, Moldavite, Obsidian, Chrome Chalcedony, Amazonite, Jadeite, Nephrite, Chalcedony, Dyed Jasper, Chrysoprase, Maw-Sit Sit, Rhodonite, Rhodochrosite, Amber, Coral, Fire Opal, Lab-created Moissanite, Cubic Zirconia, GGG, YAG, Lab-created Rutile, Strontium Titanate, Lithium Niobate, Lab-created Spinel, Glass, Lab-created Alexandrite, Garnet-topped Doublet, Spinel Triplet, Copal Resin, Bakelite and Imitation Coral.

Prerequisites: Basic Gemmology or Equivalent

Gem Identification #2



Course Cost € 500

Reserve Your
Place Now

This five day (30 hour) practical workshop focuses on the study and identification of four colour groupings (blue, violet/purple, brown and black) plus unusual and phenomenal gemstones. Gemstones covered in this workshop include:

Sapphire, Benitoite, Spinel, Tanzanite, Apatite, Tourmaline, Topaz, Aquamarine, Quartz, Iolite, Zircon, Scapolite, Garnet (Grape, Rhodolite and Hessonite), Chrysoberyl, Taaffeite, Idocrase, Ekanite, Sinhalite, Kornerupine, Andalusite, Kyanite, Euclase, Smithsonite, Sugilite, Charoite, Lapis Lazuli, Sodalite, Turquoise, Odontolite, Serpentine, Chrysocolla, Petrified Wood, Hematite, Marcasite, Pyrite, Jadeite, Jet, Chalcedony, Jasper, Coral, Obsidian, Cubic Zirconia, Bakelite, Dyed Jasper, Lab-created Forsterite, Lab-created Spinel, Lab-created Quartz, Glass, Gilson Lapis Lazuli, Gilson Turquoise, Stained Howlite, Star Sapphire, Star Ruby, Star Almandite Garnet, Star Diopside, Cat's Eye Chrysoberyl, Cat's Eye Tourmaline, Cat's-Eye Quartz, Hawk's Eye Quartz, Tiger's-Eye Quartz, Bi-Colour Tanzanite, Bi-Colour Tourmaline, Ametrine Quartz, Watermelon Tourmaline, Usambara Tourmaline, Trapiche Emerald, Labradorite, Moonstone, Bloodstone, Tortoiseshell, Shell Cameo, Hardstone Cameo, Lava Cameo, Ammolite, Fire Agate, Black Opal, Crystal Opal, Semi-Crystal Opal, Larimar, Malachite, Lab-created Cat's Eye Chrysoberyl and Imitation Cameo.

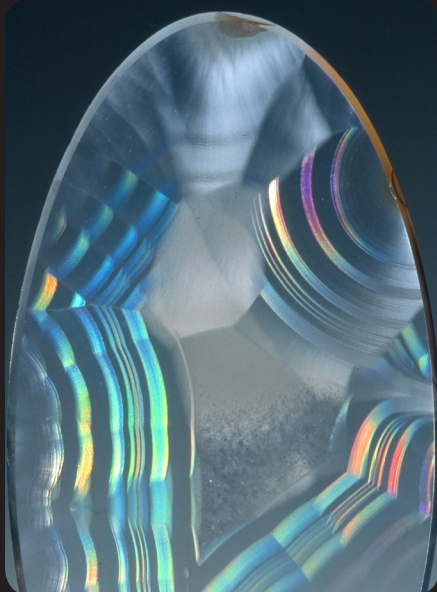
Prerequisites: Gem Identification #1 or Equivalent

Practical Workshops

Coloured Gemstone Grading #1

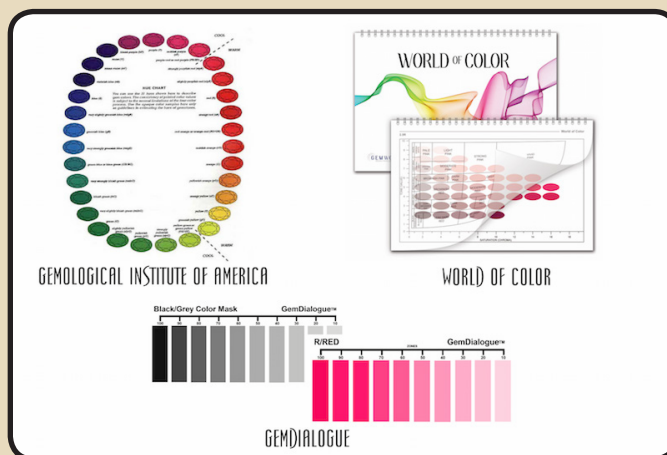
This five-day (30 hours) workshop includes practical instruction on how to access the hue, tone and saturation of coloured gemstones using three popular colour grading systems (Gemological Institute of America, GemDialogue and World of Color) and how to grade pearls, jadeite and opals.

Prerequisites: None



Course Cost € 500

Reserve Your
Place Now



Coloured Gemstone Grading #2

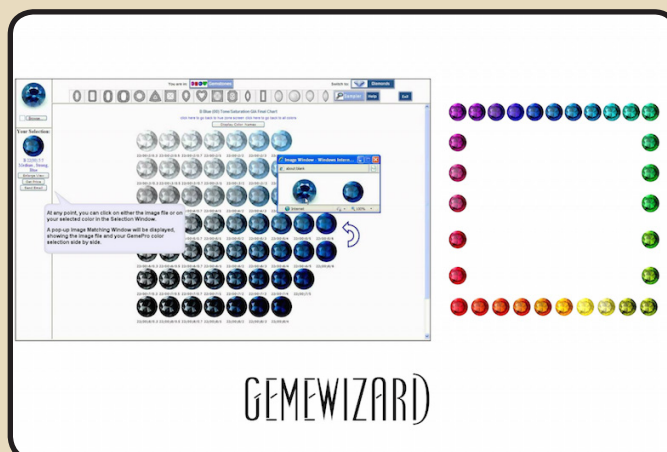
This 60 hour online course consists of a comprehensive overview of the GemWizard Colour Grading System including colour theory (hue, tone and saturation), how they impact on the value of gemstones, practical exercises that are completed online, and a six month subscription to the Gemewizard program.

Prerequisites: None



Course Cost € 1000

Reserve Your
Place Now



Practical Workshops



Course Cost € 500

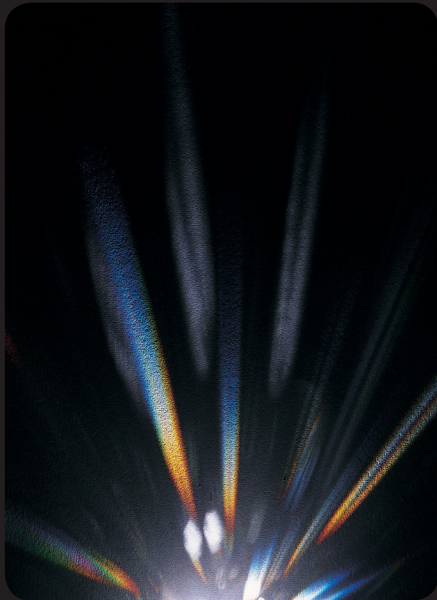
Reserve Your
Place Now

Lab-created & Treated Gems

This five day (30 hour) practical workshop focuses on lab-created gemstones (specifically rubies, sapphires and emeralds) and the many treatments and enhancements that are used to improve the appearance and/or value of gemstones, including:

- Heat treatment
- Surface and Sub-surface Diffusion
- Irradiation
- Fracture Filling
- HPHT Treatment
- Oiling
- Waxes & Dyes
- Sugar/Acid & Smoke Inhalation
- Quench-crackling with Dyes
- Coating & Foil Backs
- Laser Drilling

Prerequisites: Advanced Gemmology or Equivalent



Course Cost € 1750

Reserve Your
Place Now

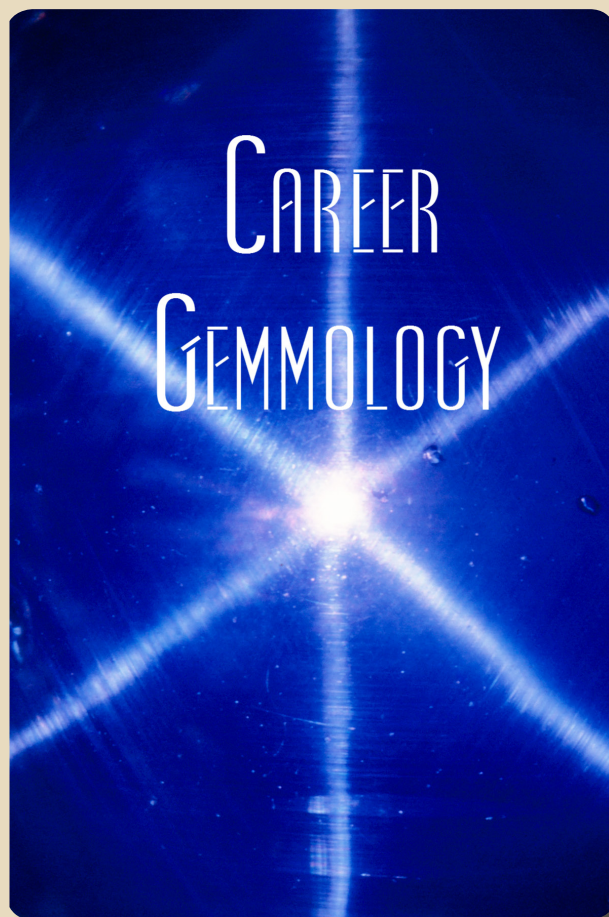
Diamond Grading & Lab-created Diamonds

This eight day (48 hour) practical workshop focuses on the clarity and colour grading of diamonds, how to measure the proportions and how to distinguish natural from HPHT and CVD diamonds.

Topics covered include:

- Clarity Grading
- Colour Grading
- Calculating Table Percentage
- Calculating Crown Angle
- Calculating Pavilion Percentage
- Estimating Girdle Thickness
- Assessing Symmetry & Polish
- Lab-Created Diamonds
- Practical Review

Prerequisites: Diamonds or Equivalent



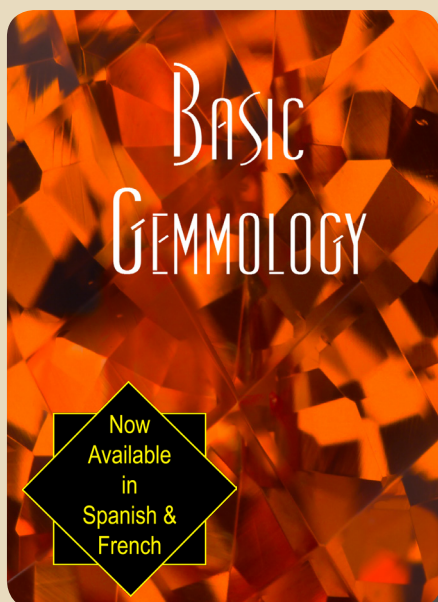
Course Content

The chemical nature of gemstones, their physical and optical properties, basic crystallography, the absorption of light, the spectroscope, refraction, reflection and the refractometer, polarized light, the polariscope, pleochroism, the dichroscope, colour filters, specific gravity, luminescence, magnification, thermal conductivity, imitation, assembled and lab-created gemstones, the methods used to manufacture lab-created gemstones including Verneuil, Czochralski, flux melt, hydrothermal, skull crucible, zone melt, horizontally oriented crystallization, high pressure, high temperature (HPHT), chemical vapour deposition (CVD), detonation, ultrasonic cavitation, sublimation method, and modified Stöber method, their unique identifying features, treatments and enhancements including heat treatment, surface and sub-surface diffusion, lead glass fracture filling, flux assisted partial fissure healing, glass fracture filling, cobalt doped glass filled sapphires, clarity enhanced diamonds, high pressure, high temperature (HPHT), quench-crackling, surface modifications, coatings and foil backs, laser drilling, and irradiation, gem mining and cutting, diamond and coloured gemstone grading, gem identification by colour and transparency, advanced gem testing techniques and a comprehensive overview of the twenty-seven most common groups, species and varieties including diamonds, corundum (rubies and sapphires), beryl (emeralds, aquamarines and other precious beryls), chrysoberyl (alexandrite and other chrysoberyl), spinel, zircon, topaz, tourmaline, peridot, quartz, garnet, tanzanite, lapis lazuli, turquoise, opal, jadeite, kunzite and hiddenite, feldspars, iolite, andalusite, diopside, apatite, pearls, coral, jet, ivory and amber.

Course Cost: € 1400

Prerequisites: None

Please Note: This course includes all the information contained in the Basic Gemmology, Advanced Gemmology, Gem Identification, Diamonds and Coloured Gemstones courses.



Course Content

The chemical nature of gemstones, physical and optical properties, basic crystallography, the absorption of light, the spectroscope, refraction and reflection, the refractometer, optical character and sign, dispersion, reflectivity meters, polarized light, the polariscope, pleochroism, the dichroscope, colour filters, specific gravity, luminescence, magnification and thermal conductivity.

Course Cost: € 200

Prerequisites: None

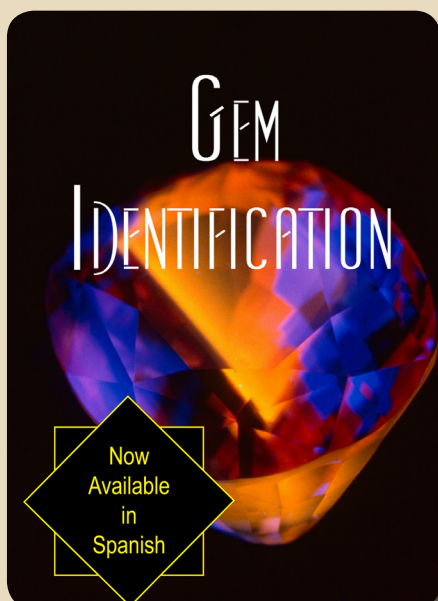


Course Content

Imitation and composite gemstones, methods used to manufacture lab-created gemstones including Verneuil, Czochralski, Flux Melt, Hydrothermal, Skull Crucible, Zone Melt, Horizontally Oriented Crystallization, HPHT, CVD, Detonation, Ultrasonic Cavitation, Sublimation Method, and Modified Stober Method, their unique identifying features, treatments and enhancements including heat treatment, surface and sub-surface diffusion, lead glass fracture filling, flux assisted partial fissure healing, glass fracture filling, cobalt doped glass filled sapphires, clarity enhanced diamonds, HPHT, quench-crackling, surface modifications, coatings and foil backs, laser drilling, irradiation, and advanced gem testing techniques.

Course Cost: € 400

Prerequisites: Basic Gemmology or Equivalent

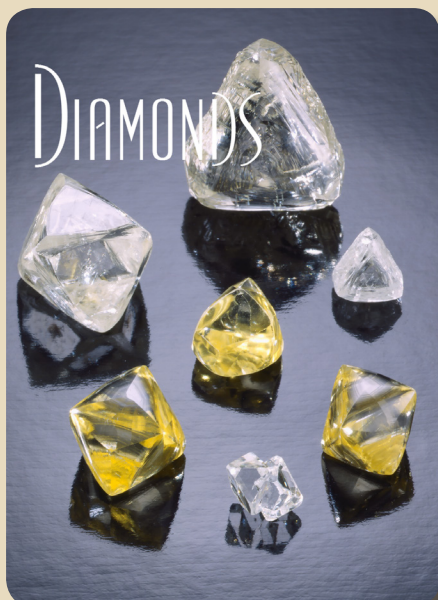


Course Content

Introduction to gem identification and the tests that are commonly used to identify gemstones. An in-depth look at each of the ten colour groupings (colourless or white, red, pink, orange, yellow, blue, green, violet or purple, brown, black or grey) plus phenomenal or unusual gemstones. Important varieties and species of gemstones that commonly occur within each colour grouping. How to distinguish gemstones that are commonly confused with each other (i.e. aquamarine and blue topaz, emerald and chrome tourmaline, diamond and lab-created moissanite) or have physical and optical properties that are similar (i.e. amethyst quartz and purple scapolite). All lab-created, imitation, treated and enhanced gemstones that are found in each colour grouping.

Course Cost: € 225

Prerequisites: Basic & Advanced Gemmology or Equivalent

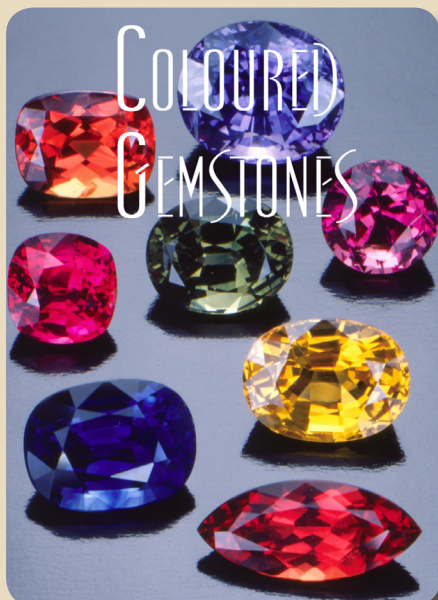


Course Content

Physical properties, geology, localities, principle mines, crystal system, chemical composition and classification, fancy colours, causes of colour, absorption spectra, pleochroism, inclusions, fluorescence, mining, gem identification, methods of synthesis, common treatments and enhancements. You will learn all about the 4 C's (colour, clarity, cut and carat weight) and how they are measured and assessed. We will also compare the various 'Cut' criteria for the Gemological Institute of America (GIA), the American Gem Society (AGS), Hoge Raad Diamant (HRD), International Gemological Institute (IGI), the European Gemological Laboratory (EGL), and Accredited Gem Appraisers (AGA) and explain how the estimated weight of a 'mounted' gemstone is calculated.

Course Cost: € 225

Prerequisites: None

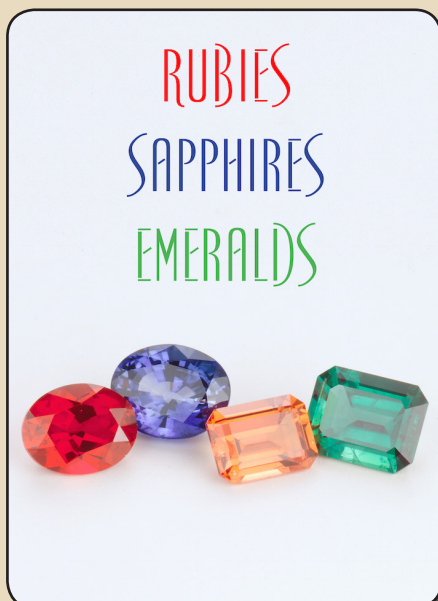


Course Content

Physical properties, geology, localities, crystal system, chemical composition and causes of colour, varieties, absorption spectra, pleochroism, inclusions, fluorescence, gem identification, synthesis, treatments and enhancements, and care guidelines. Gemstones covered in this course include rubies and sapphires, emeralds, aquamarines and other precious beryls, alexandrite and other chrysoberyls, spinel, zircon, topaz, tourmaline, peridot, quartz, garnet, tanzanite, lapis lazuli, turquoise, kunzite, hiddenite, feldspars, iolite, andalusite, diopside, apatite, pearls, coral, jet, ivory, and amber. You will learn how to accurately describe colour, the various colour grading systems currently used by professionals, the clarity classification of gemstones based on their geological environments, how cut is assessed, and how to grade opals, jadeite and pearls.

Course Cost: € 500

Prerequisites: None



Course Content

Topics covered include a complete overview of their physical and optical properties, principal sources, mining, how they can be identified from gemstones that can be deceptively similar in appearance and their lab-created counterparts, common treatments and enhancements, pricing guidelines, what constitutes the best quality and how to properly care for them.

Course Cost: € 95

Prerequisites: None



Course Content

Topics covered in the course include their physical and optical properties, geological formation, crystal systems, chemical composition, varieties and classification, cause of colour, absorption spectra, common inclusions, fluorescence, mining, grading criteria, methods of synthesis, gem identification, common treatments and enhancements, cleaning and care instructions, and pricing.

Course Cost: € 75

Prerequisites: None



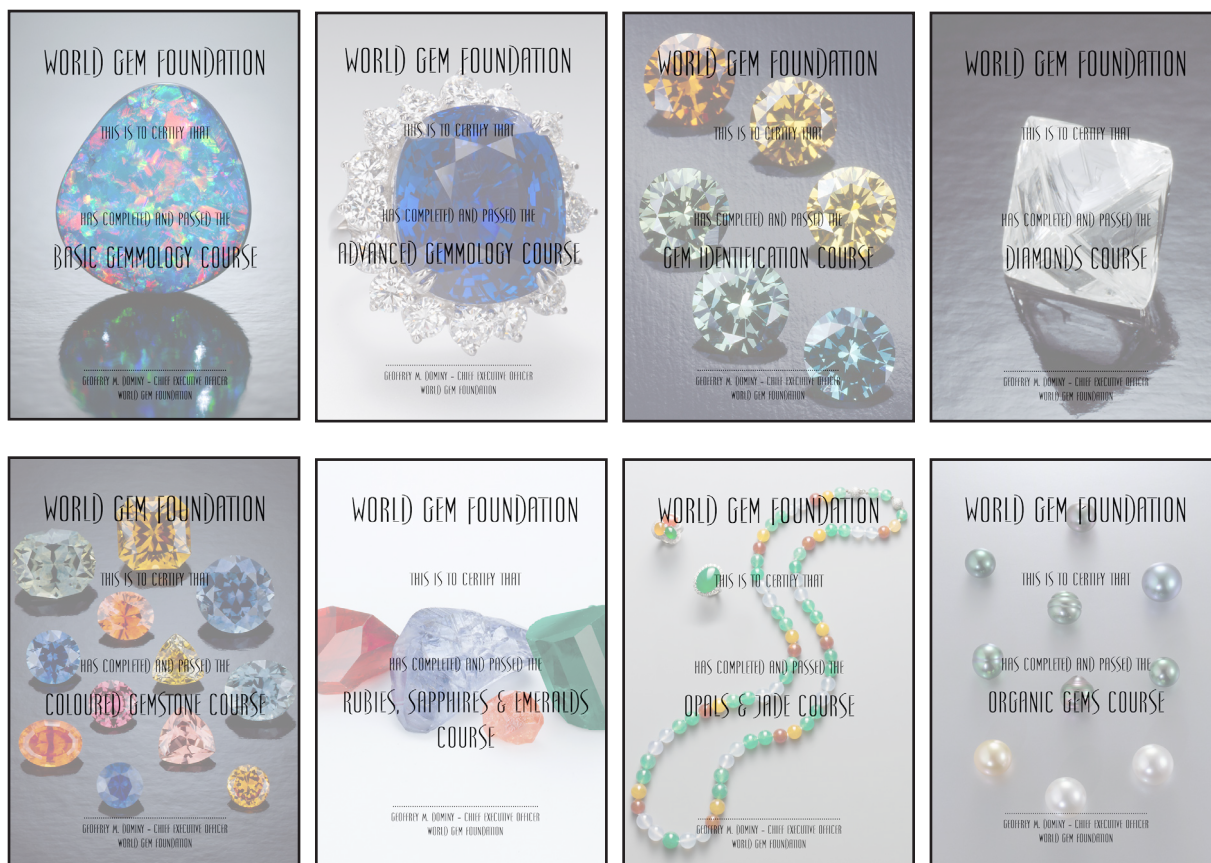
Course Content

Topics covered include their physical and optical properties, geological formation, crystal systems, chemical composition, varieties and classification, cause of colour, common inclusions and internal characteristics, fluorescence, pearl grading criteria, methods of synthesis, gem identification, common treatments and enhancements, and cleaning and care instructions.

Course Cost: € 50

Prerequisites: None

Theory Courses - Letters of Completion



Practical Workshop - Letters of Completion



A TALE OF TWO CITIES



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AMSTERDAM

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Culturally diverse and steeped in history, Madrid and Amsterdam are two of the finest cities in Europe. Can you think of two better places to study gemmology?

Madrid - 2020 Schedule

Course Name	Dates			
Gem Identification #1	March 2 - 6	May 4 - 8	Aug 31 - Sept 4	Oct 19 - 23
Gem Identification #2	March 9 - 13	May 11 - 15	Sept 7 - 11	Oct 26 - 30
Coloured Gemstone Grading #1	March 16 - 20	May 18 - 22	Sept 14 - 18	Nov 3 - 7
Lab-created & Treated Gems	March 23 - 27	May 25 - 29	Sept 21 - 25	Nov 9 - 13
Diamond Grading & Lab-created Diamonds	April 1 - 8	June 3 - 10	Sept 30 - Oct 7	Nov 18 - 25

Amsterdam - 2020 Schedule

Course Name	Dates			
Gem Identification #1	March 16 - 20	May 25 - 29	Sept 14 - 18	Nov 3 - 7
Gem Identification #2	March 23 - 27	June 1 - 5	Sept 21 - 25	Nov 9 - 13
Coloured Gemstone Grading #1	April 1 - 5	June 8 - 12	Sept 28 - Oct 2	Nov 18 - 25
Lab-created & Treated Gems	June 15 - 19	Oct 5 - 9		
Diamond Grading & Lab-created Diamonds	June 24 - July 1	Oct 14 - 21		

Please note that classes are limited to six participants. To reserve your place, please download the applicable course application forms.

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For most people, buying gemstones and jewellery is a 'blind' purchase, often made on impulse and from sellers who do not always have the best interests of their clients at heart. Kim Rix would like to change that!



Buying Gemstones & Jewellery in Thailand

Travelling abroad, especially to gem producing countries can be an exhilarating experience. It can also be a nightmare if you are not careful. It is a well known fact that when you are in 'holiday mode', you are more likely to fall prey to unscrupulous sellers who are only too keen to take advantage of you.

Kim Rix is the creator and author of *Gemstone Detective*, a series of travel guide books to help tourists who have an appreciation of beauty, buy gemstones and jewellery around the world.

In this issue, Kim looks at the intricacies and complexities of the Thai market.

Outdoor Gemstone Markets in Thailand

Bangkok

If time doesn't allow for a visit to Thailand's most well-known gem market in Chanthaburi, don't worry. Many of the dealers who trade in Chanthaburi at the weekend, come up to sell in the Bangkok markets during the week. If you're looking to invest in a more expensive gemstone, it's worth bearing in mind that the high-end gems tend to be taken straight to Bangkok anyway.

Chanthaburi

Chanthaburi Province, to the east of the country, is home to the vast majority of Thailand's gem mining. Though mining has declined there in recent years, Chanthaburi town has remained a major player in the gem trade thanks to its bustling gem market. There are regular bus and minibus services from Bangkok's Ekkamai (eastern) or Morchit (northern) terminals, and it'll take you roughly 3 ½ to 4 hours to get there.

There's plenty more to do in Chanthaburi besides gem shopping. Chanthaboon, the oldest part of town, contains an interesting mishmash of architectural styles—a legacy of Chanthaburi's long history as a trading town. The

countryside outside the town is blessed with not one but two national parks (Nam Tok Phlio and Khao Kitchakut). With their cooling waterfalls and mossy shrines, they offer peaceful respite from the heat of the day. And of course, there are plenty of shrines and temples to visit.

If like me you're tempted to Chanthaburi by the gem market, you must be sure to visit the Cathedral of the Immaculate Conception. Inside the cathedral—and behind a secure wall of glass—is a statue of the Virgin Mary presented as a gift to the cathedral by the Chanthaburi community of Christian gem dealers and goldsmiths. She is a dazzling sight. Covered almost head to foot by gold and gems, her cloak gleams with thousands of Thai blue sapphires. Sri Lankan white sapphires adorn her dress, and she stands on a globe studded with emeralds, rubies and yet more sapphires.

And so to Chanthaburi gem market itself, or Tlad Ploy as it is known in Thailand. Si Chan Road—'gem road'—is not a particularly busy part of town, except at the weekend. Friday to Sunday between 11.00 and 18.00 is when the gem market bursts into life and Saturday is the busiest day for trading. You may prefer the more sedate shopping experience offered by the Gem and Jewellery Trading Centre for your purchase, but the gem market really is worth a look, even if looking is all you do.

How to strike a deal at the Chanthaburi Gem Market

If you're intending to buy at the market, you'll need to know a bit about how it all works. Navigating the market can be daunting for a beginner. The Thai people are generous, friendly and will go out of their way to help a stranger, but be aware that the Chanthaburi market is not set up for tourists. It's a long way from the genteel marketplace of a quintessential English town. Here you'll find trading offices with buyers and dealers sitting at tables. You'll see a lot of Thai dealers selling to each other, and many people wearing head torches and head goggles (magnifying glasses). It'll be hot and noisy. So how do you go about it? Let's take you through the steps to buying a stone in a Thai gem market.

Lose the tourist look

If you were visiting London's Hatton Garden or New York's 47th Street, I would give you the same, common-sense, advice! Don't let the dazzling array of gemstones on display distract you from personal security. Keep your camera, handbag, wallet and phone close by and hidden.

Remember the rules

Thai people are famous for their kindness, patience and hospitality. Nevertheless, it will smooth the way if you remember local customs, especially outside the main tourist areas. It is not polite in Thailand to make personal contact with strangers. Instead of shaking hands, you should put your hands together and bow slightly. This is called 'wai'. Another thing to bear in mind is that Thai people consider feet to be the lowest and dirtiest part of the body. You should not sit in such a way that you display the soles of your feet to anybody, or use your feet to point or to hold a door open. If you drop a coin, you must make sure not to stop it by placing your foot on it—this would be very disrespectful to the Thai King, who is venerated in Thailand and whose image appears on coins.

The epicentre of the Chanthaburi gem market is the Si Chan Road. Here you will find rows of trading offices, many of them with storefronts open to the street. These offices provide buyer and seller with a space to trade, as well as proper lighting conditions for examining gems. The buyer sits down at one of the office tables and an assistant puts up a sign listing the gem or gems the buyer wants to purchase. Then sellers with those particular gems will approach the buyer. On completion of a sale, the seller pays commission to the trading office in which the sale has taken place. Very often, the seller will be a broker—a middleman—between the buyer and the gem's owner. In this case, the broker will need to confirm the negotiated price with the gem's owner before the final sale takes place. For security, in case of attempts to sell fake gemstones, a gem broker can prosecute the gem owner.

Keep a level head when shown the seller's stones. Look at them one by one and if you don't want any of them, be firm but polite. Say, 'No thanks', and give a reason for your decision, for example, 'It's not big enough' or 'It's not the right colour.' Let the seller gather up the stones from the table to avoid any confusion or—in the worst case—accusations of theft.

The key is to remain polite, firm and in control. Don't be rude, don't get hot and bothered, and don't let yourself get pushed and shoved around.

Negotiate Price

At the Chanthaburi gem market, you can reduce the asking price by a significant amount, but you'll need good negotiating skills! As a guide, the final price can be between 30 – 70% off the original asking price. Aim for 50 – 60%. While some brokers have good English, many do not. Because Chanthaburi is a world centre for gem trading, it is not unusual for buyer and seller to negotiate wordlessly by inputting figures into a calculator passed between them.

Wait for Confirmation

Once you have agreed a price with the broker, the gem will be placed in a packet, sealed up and the agreed price written on it. The broker will show you the price on the packet to confirm and finalise your offer. Now all you need to do is wait for the broker to confirm with the gem's owner that the sale can proceed. Make sure you agree a time limit for the broker's return to prevent him trying to get a better deal elsewhere. 30 minutes should be long enough, but certainly no longer than 2 hours. If the owner's answer is yes, congratulations—you are now the proud owner of a beautiful gemstone!

Get it tested and certified

The most difficult aspect of buying at a gemstone market is identifying whether a gemstone is natural, synthetic or imitation. With all the excitement, heat and pressure it's easy to give in to buying before you check. DON'T! Make sure it is real. You must make sure you are not being sold a less valuable stone or, worse, something out of a Christmas cracker!

Don't be fooled by alternative names. Bohemian rubies are NOT real rubies but semi-precious garnets. So are Australian, American, Adelaide, Californian and Rock rubies—the list goes on. In a nutshell, if the word ruby is preceded by an unexpected description, be prepared to walk away!

Any market gem dealer should be happy to walk with you to the nearest gem lab to get your gemstone tested for authenticity. In Chanthaburi gem market, this is the Chanthaburi Gemological Laboratory at 19/4 Si Chan Road—the same road as the main market. At this point, all you really need is confirmation from the lab that what you have in your hands is really what the dealer says it is. A verbal assurance is fine for now; if you want your gemstone officially certified, you can get a lab report after purchase.

The Gem and Jewellery Trade Centre

If buying at the market doesn't appeal, you'll find plenty of choice at Chanthaburi's Gem and Jewellery Trade Centre (GJTC). The trade centre houses a large number of traders, selling everything from single gemstones to job lots, along with plenty of jewellers and a gem lab. Sponsored by the CGA (Chanthaburi Gem and Jewellery Traders Association), all traders in the centre must be registered with this organisation. It's the CGA's way of trying to ensure that the centre builds a reputation for reliability in a country where the gem market is not subject to government regulations other than tax.

Gemstone Museums in Thailand

Gem and Jewellery Institute of Thailand (GIT) Jewellery Museum

ITF Tower Building, 2nd Floor, Silom Road,
Suriyawong Bangrak, Bangkok 10500
T: +66 2634 4999 ext. 312
F: +66 2634 4999 ext. 436
Email: jewelry@git.or.th

Allow yourself an hour to visit this small, interesting museum. Here you can learn about gem mining and processing, different varieties of gemstone and jewellery manufacture via exhibitions and video presentations.

Siamgems Heritage Museum

234 Pradithmanutham Rd, Nuanchan,
Bueng Kum, Bangkok 10230
T: +66 2949 9500 ext. 0
F: +66 2949 9526
Email: front@siamgemsheritage.com
Web: www.siamgemsheritage.com

A visit to the ultra-modern galleries of the Saimgems Heritage Museum is a breath-taking experience. Newly opened in 2017, the museum takes visitors through Thailand's history of gem mining and craftsmanship via multi-media experiences, exhibitions and demonstrations. The museum contains some stunning exhibits, including an enormous golden statue of two elephants, and the world's rarest ruby—a 21.09 carat Thai ruby, set in a diamond tiara and surrounded by a further twenty-four one carat rubies. A visit would make a wonderful precursor to your gem-buying expedition. Guided tours run every half-hour and entry costs 300 baht for foreign visitors (200 baht for children).

VAT Refunds Process

Holiday makers can claim a VAT refund on purchases at the airport when they leave the country, so be sure to keep your receipts. Note that you cannot get a VAT refund on loose gemstones. Although, there are some jewellers that are still not VAT registered, most are. The sole traders are most likely not, because many work for a small commission from dealers from whatever amount they sold. Check when you make your purchase.

If you are intending to claim a VAT refund, make sure you leave plenty of time at the airport to do so. I'd suggest at least an extra 30 minutes. The queue at the VAT refund desk can be very long!

You can contact Kim through her website:

www.gemstonedetective.com

Excerpts from 'Buying Gemstones
& Jewellery in Thailand.'

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Synthetic Gemstones in Bangkok (Photo by Kim Rix)



Inside the Jewellery Trade Center in Bangkok (Photo by Kim Rix)



Gem Market in Chanthaburi (Photo by Kim Rix)



Onlookers at the Chanthaburi Gem Market (Photo by Kim Rix)



View from Buddhist Temple overlooking the valley in Chanthaburi with Ploy Waen Volcano in the background (Photo by Kim Rix)

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Geoffrey M. Dominy
WGF Founder

Geoffrey Dominy is an author, independent gemmologist and former jewellery appraiser who appeared on the Canadian Antiques Roadshow for four seasons. He received his F.G.A through the Gemmological Association of Great Britain (Gem-A) in 1987 passing the diploma examinations with distinction.

Throughout the 1990's, Geoff developed and taught the 'Gemmology' program at Red River Community College and The University of Manitoba in Winnipeg, Canada, worked for the Canadian Institute of Gemmology, was President and Founder of the Jewellery Appraisers Association of Canada and was a contributing author for the 5th & 6th Editions of Robert Webster's 'Gems' which even today is considered one of the most authoritative textbooks in Gemmology.

In 2013, he released the first digital gemmological textbook entitled 'The Handbook of Gemmology' in collaboration with world famous gem photographer Tino Hammid. Now in its fourth edition, the handbook has been sold or downloaded in fifty-three countries, is used by fourteen schools, colleges, universities and gemmological organizations as their recommended textbook and now features photographic contributions by other award winning photographers including Jeff Scovil.

In 2018, Geoff released a 5th Anniversary Printed Edition (Two Volumes) and on December 14th, 2019, released his first book in Spanish 'Gemología Para Todos' (the first 14 chapters of the Handbook of Gemmology).

He currently lives in Palma, Mallorca, Spain and in addition to lecturing and promoting his books, is the founder of the World Gem Foundation and Mi Isla También.



Leone Langeslag
Dutch Gem Academy

Leone Langeslag is a graduate of the Federation for European Education in Gemmology (FEEG) (2006), an independent gemmological consultant and is actively involved with the Gemma Association in Holland offering lectures and workshops. Her desire to provide accessible gemmological training in the Netherlands has lead to the formation of the Dutch Gem Academy.

Leone is a frequent visitor to international symposiums, exhibitions and trade shows where she continues her own gemmological education and passion for collecting gemstones and minerals.



Deborah Mazza
British Gem Academy

Deborah Mazza is half Italian and half British, and started her journey through the world of gemstones in Germany in 1984, where she studied at the Deutsche Gemmologische Gesellschaft attaining her gemmology and diamond diploma; she subsequently gained her FGA in 1986.

Deborah then went to work for the trade in Idar-Oberstein, buying and selling wholesale gems and diamonds, working as a gemmologist and teaching gemmology at the DGemG, this lead on to carrying out jewellery valuations for an insurance company in Germany. She later got a Bachelor in Business in Germany, and returned to the UK in 2010, where she became a tutor for the Gem-A's online courses. Deborah, keen to add to her knowledge, started to study again and passed the NAJ/IRV's CAT jewellery valuation diploma, and is now studying History of Art at Goldsmiths University. Deborah has her own valuation business and works part-time for an online auction house. She contributed several written pieces for Yavorsky's new book, Terra Connoisseur: Gemstones. She is currently the Director of Education for the British Gem Academy.



Conny Forsberg
Scandinavian Gem Academy

Conny Forsberg has over thirty years experience as a gemmologist and precision gem cutter. He received his FGA in 1986 through Gem-A, his diamond grading diploma through Hoge Raad voor Diamant (HRD) in 1994 and is an Accredited Senior Gemologist with the Accredited Gemologist Association (AGA).

He is currently the owner of the Swedish Gem AB, a modern and accomplished gem lab as well as a precision cutting facility. He has twice received 'Honourable' mention in the Gem-A photo competition for his photomicrography (2011 & 2013) and is a valued contributor to the Handbook of Gemmology, with a large collection of his photomicrographies planned for the upcoming 4th Edition. Conny is also an Accredited PRINCE2 Practitioner (Project Management), experienced in public procurement and contracting (EU law) and the initiator and organizer of the Scandinavian Gem Symposium. He is currently the auditor for the Swedish Gemmological Association.

Jan Asplund is a gemmological consultant specializing primarily in the identification and valuation of diamonds, both cut and rough, as well as coloured gemstones and jewellery.

He received his FGA & DGA (Gem Diamond Diploma) through Gem-A in 2011, his BA in History from the Mälardalens University in 2000 and studied geology and gemmology at Luleå Technical University (2005 – 2007), cultural and industrial history at the Uppsala University (1998 – 2000), and archival science at Karlstads University (1998 – 1999). Jan also took his Accredited Jewelry Professional – AJP (Gemological Institute of America 2011), Introduction to Watches (International School of Gemology 2012), Jewellers Education Foundation – Graduate Sales Associate (American Gem Society 2011), Blacksmithing (Sätergläntan 2002) and Silversmithing (Tärna Folkhögskola 1996).

He is a board member of the Swedish Gemmological Association, fellow and diamond member of Gem-A and initiator and organizer of the Scandinavian Gem Symposium.



Jan Asplund
Scandinavian Gem Academy



Leroy Bakelmun
Gem Academy of Canada

Leroy Bakelmun started his gemmological career after receiving his certificate in gem cutting and polishing at the Lapidary Training Centre Sri Lanka in 1995. In the same year he also received his certificate in Gem Identification, through the A.K. Institute of Gemmology in Sri Lanka.

In 2006 he received his 'Gemmologist' certificate through the Canadian Institute of Gemmology (C.I.G.)

Leroy has extensive experience buying and selling gemstones. From 1997 to 2014, he owned and operated GeoGem Jewellers in Langley, British Columbia, Canada and from 2012 to 2014, he also owned the 925 House of Silver in Fort Langley, British Columbia, Canada.

Gérard Raphaël Quintin was born in Paris France where he studied Art and Design and graduated from Ecole Boulle. His taste for the diamond world may have been inherited from an uncle who worked in the diamond business.

In 1978 he took the gemology colored stone and diamond course with GIA while he was mining diamonds in the Sewa River in Sierra Leone and where he started the first diamond cutting center in West Africa.

In Abidjan Côte d'Ivoire in 1992 Gérard founded the diamond cutting formation center with a gemmological laboratory 'Hardy's', followed by the installation of the colored stone and diamond cutting facilities in the jewelry school EIBMA.

Continuing his tour in the world of gemstones, Gérard went to Madagascar as an expert for a French Government project to develop the organization and skill of the gems sector.

Professor of Gemology in the Jean Guehenno Jewelry School in Saint-Amand-Montrond France, he then moved to Bolivia to fund and manage the 'Instituto Gemologico Boliviano' where students learn gemology and the art of gem cutting.

Since 1997 Gérard has been a member of the Organisation Internationale des Experts based in Geneva, Switzerland.



Gérard Raphaël Quintin
South American Gem Academy



Cristina Rzepka de Lombas
Central American and
Caribbean Gem Academies

Cristina Rzepka de Lombas is a geologist, gemmologist, appraiser of gemstones and jewellery and an expert in diamond and coloured gemstone grading.

Currently Cristine serves on the Board of Directors of the Instituto Gemológico Español (IGE) in Madrid, Spain where she also teaches their 'Gems of Organic Origin' course.

She is also the Director of Education for the Central American and Caribbean Gem Academies.

Kyalo Kiilu is a fellow of the Gemmological Association of Great Britain (Gem-A) and an Alumnus of Birmingham City University where he obtained his BSc with honours in Gemmology and Jewellery Studies in 2017.

His passion for gemstones can be traced back forty years to his late grandmother's village in rural Kenya and the prospecting trench dug by the first British gemstone explorers in the early part of the 20th Century.



Kyalo Kiilu
East African Gem Academy

While pursuing his pharmaceutical studies, his interest in gemstones never diminished. Unfortunately in 2003 there were no colleges in Kenya offering gemmological courses so he decided to relocate to England and enrolled in Gem-A's Diamond Diploma program in 2004; the start of his gemmological journey.

Kyalo is a licenced gemstone prospector in Kenya and in 2015 made a discovery of a very unique sapphire, resembling another Kenyan sapphire marketed as 'Goldsheen Sapphire' that he will hopefully share with the gemmological community very soon.

He comes to the World Gem Foundation and specifically the East African Gem Academy with a strong desire and ambition to share his knowledge of gemstones with his fellow East Africans, particularly those involved in the production of gemstones, gemstone lovers and aspiring gemmologists, to provide support and encouragement that was so lacking in the industry when he was growing up in Kenya.



Salomon Lutumba
Gem Academy of DR Congo

Salomon Lutumba is an alumnus of Birmingham City University where he graduated with a Bachelor in Science with honours in Gemmology and Jewellery studies in 2016. He also holds a Diamond Diploma and Gemmology certificate from Gem-A. He is originally from the Democratic Republic of Congo.

In 2002 he relocated to England where, ten years later, he found the opportunity to fulfil his dream of studying gemmology at the Birmingham City University. In 2012, he started his High National Diploma in Gemmology combined with Gem-A's Diamond and Gemmology program which led to a degree program, introduced for the first time in 2015, at the BCU.

Today, by embracing the World Gem Foundation's concept and philosophy of gemmological education, and through the Gem Academy of DR Congo, he would like to share his passion and knowledge of gems with his fellow Congolese; particularly jewellers, aspiring gemmologist and gemstone lovers.

His personal goal is to promote the science of gemmology in his country, by providing information and support to empower people in the jewellery business and those trading in stones.



Jack Ghazalian
American Gem Academy
Director of Corporate & Career
Development

Jack Ghazalian has thirty-eight years of experience in the jewelry industry. He is a graduate gemologist through the Gemological Institute of America (1992), was an instructor for GIA (1993) and was officially Certified-by-the-State of California Education Code 94311(a) to teach Gemology & Jewelry Manufacturing-Arts (1993).

In October 2015, he was honored by the International Distinguished Scholars – Academic Honor Society as an 'International Distinguished Scholar' and in 2017 was granted membership in Kappa Delta Pi. He is currently the owner of Isometric Gemological Appraisal Services in Southern California: IsometricGems.com, speaks five languages and is passionate about education.

Barickeh Charles Kholifa

Koroma is a freelance gemmologist, diamond grader/valuer, a member of the Gemmological Association of Great Britain and a member of the Scottish Gemmological Association. He was born in Liberia to Sierra Leonean parents and raised in the mineral rich country of Sierra Leone where he survived a devastating brutal civil war which lasted for almost 12 years.

He relocated to the United Kingdom in 2004 and received help on how to cope with Post Traumatic Stress Disorder (PTSD), which now proves pivotal in his approach to life.

He attended the coveted School of Jewellery, Birmingham City University (BCU) where he studied a diploma in diamonds (Gem-A) and a BSc (Hons) in Gemmology and Jewellery Studies. He graduated with a first-class degree in 2018 and was awarded the prestigious Scottish Gemmological Association Prize for Gemmology. He then moved back to Sierra Leone to pursue his dreams. His greatest achievement so far is working as a student mentor during his time at the university, he was able to give advice and guidance to some students that were struggling to cope with the demands of higher education and being away from home.

Like Kyalo, he comes to the World Gem Foundation and specifically the West African Gem Academy with a strong desire and ambition to share his knowledge of gemstones with his fellow West Africans, particularly those involved in the production of gemstones, gemstone lovers and aspiring gemmologists, to provide support and encouragement that was so lacking in the industry when he was growing up in Sierra Leone.



Barickeh Charles Kholifa Koroma
West African Gem Academy



Ludovic Durand Oro
French-Swiss Gem Academy

Ludovic Durand Oro

graduated from the Federation for European Education in Gemmology (FEEG) in 2012, has taught at the French Gemmological Institute in Paris (France), was the Director of Education of a gem school based in Monaco and in 2019 co-founded the Academy of Applied & Technical Gemology (AGAT gem school) as well as

the French-Swiss Gem Academy (FSGA), both based on the French Riviera in Nice, in the south of France.

A true gem enthusiast, he loves to organize gem field trips for his students to gem producing areas around the world while also acquiring top quality gemstones for his private clients.

Dr. Laurent Massi completed his PhD studies on 'Atomic-scale Defects in Brown and Hydrogen-rich Diamonds' at the Department of Physics at Nantes University in France under the direction of Professor Emmanuel Fritsch. During his studies he also taught gemology in Paris at the French National Gemological Institute.

Dr. Massi subsequently taught gemology and gave presentations at conferences in numerous countries all around the world. During his career he has also had the opportunity to publish a variety of scientific and educational articles on color-change corundum, hydrogen- and CO₂-related optical centers in diamond, chameleon diamonds, clinohumite, color-change bastnäsite and on a new gem mineral: hibonite, one of the rarest gems on Earth.

Dr. Massi was the Director of the Asian Institute of Gemological Sciences (AIGS) Gem Laboratory and Gem School based in Bangkok - Thailand. He subsequently completed his Graduate Gemologist (GG) studies at the Gemological Institute of America (GIA) headquarters in Carlsbad, USA and then became the Director of the new GIA Thailand Campus located in Bangkok - Thailand.

With more than 20 years of experience in the Gems & Jewelry industry, Dr. Massi is now the head of both the new international gem academy AGAT (for 'Academy of Applied & Technical Gemology') as well as the co-founder of the French-Swiss Gem Academy (from the World Gem Foundation), both housed in the Majestic building - a former palace from the Belle Epoque - located on the French Riviera, in Nice - France.

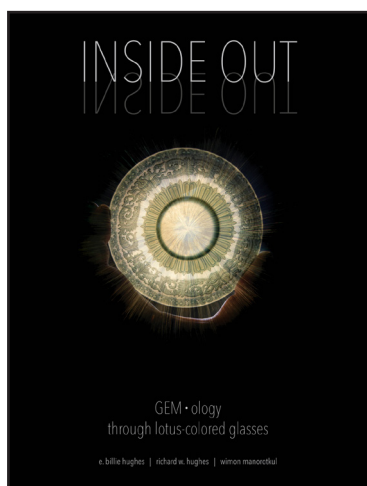


Dr. Laurent Massi
French-Swiss Gem Academy

Literary Speaking

Expand Your Mind

In this issue Richard W. Wise looks at *Inside Out, Gemmology Through Lotus Colored Glasses* by E. Billy Hughes, Richard W. Hughes and Wimon Manorotkul



To call the latest offering from Lotus Gemology a gemology book is something of a stretch. 'Inside Out, Gemmology Through Lotus Colored Glasses', presents the reader with images of natural processes, frozen in time, juxtaposed against one of those things the camera does best, the capture of fleeting human emotions.

Consider 'Bluebell Blossoms' (pp. 13-14). Like the image of an exploding firework outlined against the night sky and like many of the images of the gemstone microworld in this artfully composed volume, the image conveys the impression of a frozen instant when, in truth, it depicts the end result of a process which required, perhaps, thousands of years to unfold. Others, like 'Cave Paintings' (p. 40) which depicts dendritic healing in Burma ruby, seems, as its title suggests, to have lain in the darkness, awaiting discovery, since time began.

Like a gemological Rorschach test, all these images are open and available for interpretation. Some evoke a fantasy landscape, others a lost world. In 'A Sapphire for Your Thoughts' (pp. 48-49) a negative sapphire crystal floats past the viewer like a massive asteroid orbiting an uncharted world.

The book is laid out so that almost every other image is of a human subject or a landscape, sometimes a combination of both. Many are portraits. Some of the human subjects are excited, some bored, others apprehensive but in all cases, the three photographers—none of the images are attributed—manage to capture a mood. Often enough, the

total composition conveys a good deal more—an expectation, a disappointment.

In the image entitled 'Leaving Las Vegas', a miner exits a Madagascar mining village (p. 143). Did he make the big score or come up empty? His head is bowed, his face in shadow, yet some how we understand that he is homeward bound, leaving behind the temporary sprawl of miner's shacks, like empty tin cans strewn across a field. In 'Border Crossing' (pp. 22-23) we are presented with a tableau familiar to traveling dealers. A plaintive image, miners' eyes blurred behind a wooden fence. Sharply focused, a work torn hand thrusts a tanzanite crystal, straight toward the viewer, hoping for a sale.' In 'Broken Dreams' (p. 109) a willowy young Thai girl stares through a broken windshield of a wrecked vehicle inviting us to contemplate the psychological impact of a failed rebellion.

These landscapes are evocative. A particular favorite of mine is 'Throne Room of the Mountain Gods', (pps. 42-43). A half-length portrait of a Tibetan man in traditional dress looks out against a stark mountain backdrop. The photographer places him at just the point where the picture plane meets the viewer's space, creating a sense of intimacy. Amused, the man looks us in the eye, ready to shake our hand.

The juxtaposition of the book's images works better in some cases than it does in others, but taken as a whole, the authors of this beautifully designed and lushly manufactured, large size folio, presents us with a series of beautifully photographed, evocative images which are a joy to behold. Available in both a standard and a slip-cased limited edition of fifty, signed by the three authors, 'Inside Out, Gemmology Through Lotus Colored Glasses', makes for a wonderful gift and is a must for every gem book collector. The book ships directly from Lotus Gemology, Bangkok.

Inside Out, Gemmology Through Lotus Colored Glasses
E. Billy Hughes, Richard W. Hughes and Wimon Manorotkul
Lotus Gemology, Bangkok
152 pages; 270 x 360 mm (10.6 x 14.2 inches); 2.5 kg shipping weight
ISBN: 978-0-9645097-3-3
Bilingual text: English/Chinese
Standard Edition: \$100.00 plus shipping

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by *Dr. Laurent Massi*

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In the Eye of the Beholder

In this issue, NINA ZOLOTUKHINA looks at one of the most important tools a gemmologist uses and asks the question 'Are all Eye Loupes Created Equal?'. While perhaps a little less scientific than the ASSURE testing, it again shows the importance of knowing that the instruments you are using are up for the job.

Through the Looking Glass - The Giant Loupe Test

A magnifier is of paramount importance to gemmologists. This is the first thing they will pick up when observing a new stone. Using a magnifying glass, they can make a description of the stone, tell its shape and type of cut, determine its color, quality of the cut and draw conclusions about its natural or synthetic origin, based on the inclusions and the color features of the stone.

Due to its importance, the choice you make must be one that is taken very carefully. After all, if you buy a low-quality magnifier, you may not see an important feature of the stone, and indeed if used for a considerable amount of time could result in problems with your eyesight.

Magnifiers can be very diverse: of different magnifications (5x, 10x, 15x, 20x, 30x, 40x, 50x), sizes, with or without an auxiliary light source, different styles (forehead, tabletop, manual) and purposes: standard for the inspection of stones, dark-colored for examining the internal features of a stone, measuring with a built-in gauge and proportional (hearts and arrows) to check the quality of the cut.

The purpose of this article is to review nine different loupes and to see how they compare to each other.

The following loupes were included in the test:

1. Gemoro Light Loupe 10x (USA)
2. Gemoro Eclipse 10x (USA)
3. Klio 10x (Russia)
4. Belomo 10x (Belarus)
5. Schneider LS 10x (Germany)
6. Belomo 20x (Belarus)
7. No name 30x (China)
8. No name 40x (China)
9. No name 60x (China)

Testing

To ensure that each loupe was tested under the same conditions, testing was carried out from the same distance, under daylight with a temperature of 6500K. The subject of

the survey were Citrine crystals measuring 8mm and 10 mm in height and a Goethite inclusion measuring 1 mm high.

Results of Giant Loupe Test

So, how did they rate?

Due to the fact that it is impossible to take the highest quality pictures, I will also write my comments on the test results.

GemOro Loupes

The GemOro loupes were surprising. While there was a slight difference in price, the differences in the images were significant. The 'Light' loupe model has an extremely shallow depth of field, which makes it quite inconvenient to use. Within this depth, the image is quite sharp, and it also gives the lightest image of them all. Its sister, 'Eclipse' showed a good result, when viewing the inclusion, it had a sufficient depth of field so that the crystal could also be seen simultaneously with the inclusion. The wisely-made additional illumination and the UV flashlight make it an indispensable assistant in the traveling version!

Schneider Loupe

While proven when viewing diamonds, it also gave a good result with the colored stones and was once again noted for its 'clarity of the image', but it was not so far from its competitors, namely: Gemoro Eclipse (\$ 65) and Klio (\$ 11), with the latter clearly attractive at that price!

Chinese Loupes

None of the magnifications (30x, 40x and 60x) were true. The 30x and 40x were no more than 10x while the 60x was in the 15x region but there was some good news. Despite the discrepancy between the magnification indicated on the case and a rather small viewing circle, the 60x magnifier gave a surprisingly sharp picture at a magnification of about 15x and a price of \$ 5!. It also has a backlight and can be perfectly used for a more detailed inspection, for example, mineral samples that can scratch expensive lenses.

Belomo Loupe

The Belomo loupe showed an average result in the ratio of price - quality. You could note quite rich colors in the 10x magnifier, good visibility, but a very small depth of field in the 20x magnifier. On the downside, there was noticeable blurring along the edges and a weakening fixing screw on the 10x meaning you have to additionally support the open magnifier with your fingers.

Conclusions

Firstly, the same manufacturer is not always a guarantor of the same quality. Secondly, the most expensive models are not always the best. If you look, you can find good options for a very good price without compromising the overall

quality of the image. Thirdly, be aware of the descriptions and assertions made by the cheaper Chinese loupes and microscopes. What you see is not always what you get.

Based on this test, I would rate these eye loupes in the following order:

1. Schneider 10x
2. Gemoro Eclipse 10x
3. Klio 10x
4. Belomo 10x
5. Belomo 20x
6. Gemoro Light Loupe 10x
7. No name 60x
8. No name 30x
9. No name 40x



Citrine Crystal



Belomo 10x



Belomo 20x



No Name Chinese 30x



No Name Chinese 40x



No Name Chinese 60x



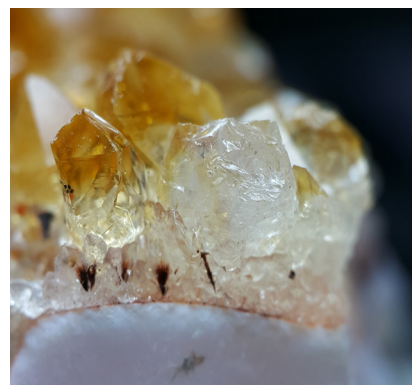
GemOro Eclipse 10x



GemOro Light 10x



Klio 10x



Schneider LS 10x

Editors Note:

We are delighted to welcome a new contributor to Gemmology Today and excited about future articles, especially relating to the testing of equipment, that she will bring to our readers.

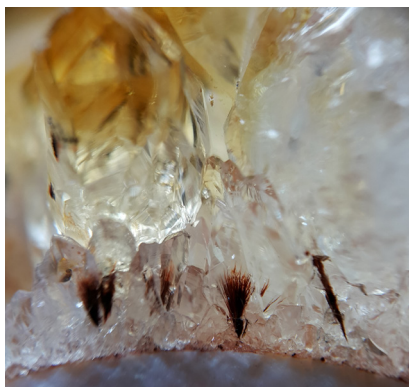
Nina Zolotukhina, also known as NinaGold, studied gemmology at Moscow State University, is an independent gemmologist, now based in Bulgaria, founder of Gemlab Europe Project, researcher, gem expert and author of reviews and articles about gemstones, research methods and gemmological equipment. She is an avid mineral and gemstone collector and photographer of minerals and inclusions (photomicrography).



Goethite inclusion



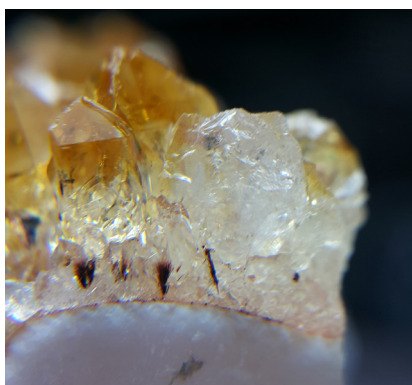
Belomo 10x



Belomo 20x



No Name Chinese 30x



No Name Chinese 40x



No Name Chinese 60x



GemOro Eclipse 10x



GemOro Light 10x



Klio 10x



Schneider LS 10x



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The Spice of Life

Coloured Gemstones



LEONE LANGESLAG is the CEO of the Dutch Gem Academy and owner of Sole Leone. She received her European Gemmologist (E.G.) diploma from the Federation for European Education in Gemmology (FEEG) in 2006.



Kyanite

Kyanite is an outstandingly beautiful gemstone, which is rarely encountered in the 'typical' jewelry store. Best known for its lovely blue colour (where it can easily compete with sapphire), Kyanite is more often purchased by collectors. Due to the inconsistency in the colour and the directional hardness, Kyanite is not extensively mined.

Etymology

The name Kyanite is derived from the Greek word 'kuanos' or 'kyanos', which means 'deep blue', alluding to its typical blue color. Once the mineral was called 'Disthene' which means "two strengths". Another synonym for Kyanite is 'Cyanite'.

Geology

The mineral Kyanite is found mainly in metamorphic rocks, mostly formed from the high-pressure alteration of clay minerals during the metamorphism of sedimentary rocks. It is mostly found in the schists and gneisses of regionally metamorphosed areas. Due to this fact Kyanite is often associated with other metamorphic minerals such as corundum and garnet.

Gem Deposits

Kyanite can be found in many locations around the world including Brazil, Cambodia, Burma (Myanmar), Switzerland, Russia, Kenya, the U.S. (North Carolina, Connecticut, and Maine) and Zimbabwe. In 1995, a relatively new discovery of Kyanite was found in Nepal and it is now widely regarded as one of the finest sources for Kyanite, with many convinced that the color can compete with the finest Sri Lankan and Madagascan sapphires.

Orange Kyanite was recently discovered in Tanzania, while large teal colored crystals have also recently been found in Kenya's Umba Valley.

Industrial Usage

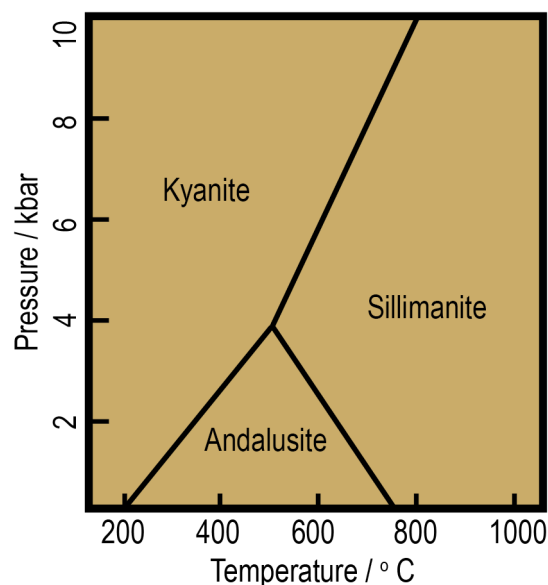
Kyanite is used to manufacture a wide range of products from the manufacture of refractory products (such as bricks

and mortars) to automotive and railroad industries where heat resistance is important. Kyanite is also used in common forms of porcelain, such as dentures, sinks and bathroom fixtures.

The properties of Kyanite make it exceptionally well suited for the manufacture of high-refractory-strength porcelain - porcelain that holds its strength at very high temperatures. A familiar use of this type of porcelain is the white porcelain insulators on spark plugs. Kyanite is also used in the manufacture of grinding and cutting wheels, where it is used as a binding agent that adheres the abrasive particles together in the shape of a wheel.

Characteristics

Kyanite, Andalusite and Sillimanite are all examples of polymorphism due to the conditions under which they were formed. All three have the same combination of chemical elements, as indicated by the chemical formula Al_2SiO_5 . Andalusite is the least dense, having formed under the lowest pressure, whereas Kyanite is formed under the highest-pressure conditions, resulting in a closely packed internal structure that also makes it the densest of the three.



Phase diagram of Al_2SiO_5



Kyanite (Photo by Tino Hammid)

Kyanite belongs to the triclinic crystal system with a typical bladed crystal and often-fibrous habit.

Kyanite's most distinctive characteristic is its directional hardness that varies based on the crystallographic direction. When cut parallel to the c-axis, the hardness can range from 4 to 4.5 on the Mohs scale. When cut perpendicular to the c-axis, the hardness can range from 6 to 7. Cleavage is perfect but splinters might appear.

Color

Kyanite is allochromatic and occurs in a range of colors from colorless to blue, blue-green, brown and orange. The blue variety is the most commonly encountered with the color a result of iron and titanium (charge transfer from Fe^{2+} - Ti^{4+}) Green Kyanite is due to the presence of vanadium, while iron and/or manganese are believed to produce the orange colouration.

Blue Kyanite can show strong trichroism from colorless/pale blue to greenish or violet-blue to dark blue.

Physical Properties

The identification of Kyanite can be accomplished using standard gemological equipment.

Kyanite has an R.I. of 1.710 – 1.734, is doubly refractive and a specific gravity of 3.53 - 3.70.

While Taaffeite (R.I. 1.719 – 1.730) and Idocrase (R.I. 1.700 – 1.723) are also optically negative, Taaffeite and Idocrase are uniaxial while Kyanite is biaxial.

Although Tanzanite (R.I. 1.691 – 1.700) is also biaxial, determination of its optic sign (+) and the use of undiluted diiodomethane (S.G. 3.33), where Tanzanite will freely suspend while Kyanite will sink, will help to separate the two.

Kyanite does not have a distinctive absorption spectrum and under UV light, some stones containing chromium (Nepalese) will exhibit weak to red fluorescence.

Inclusions

Kyanite is found in a range of transparencies from transparent to translucent, however typically they will exhibit visible flaws. The strong color zoning, best seen using oblique illumination, is often mistaken for inclusions. The most common inclusion in Kyanite is rutile. Research on Nepalese Kyanite showed large cleavage fractures, growth tubes, liquid inclusions and black crystals. All of these inclusions can produce iridescence when using oblique illumination. Blue Kyanite can be found as an inclusion in diamonds!

Cut

Kyanite is a challenging mineral to cut because of its differential hardness and must be cut by a skilled cutter who is familiar with this material.

High-quality and nicely colored Kyanite can be cut into attractive and desirable cabochons and faceted stones. These are often used in rings, earrings, pendants, and other jewelry. Kyanite is also used to make beads. These beads often have a flat geometry because the mineral typically occurs in thin blades. Kyanite looks best in daylight and exhibits a vitreous to near-pearly luster when cut and polished.

Kyanite stones of over 2 carats are considered rare but can reach 10 - 15 carats.

Optical Effects

Chatoyancy and asterism have been reported but are quite rare. Stones exhibiting an alexandrite-like effect due to pleochroism are also known.

Treatments and Enhancements

Normally Kyanite is not treated, however there have been reports of stones being treated with oil or other synthetic lubricants to enhance their luster.

Synthesis

There are no reports of Kyanite being synthetically produced.

Cleaning and Care

Pale blue Kyanite is reported to lose its color when heated to 1200°C.

Conclusion

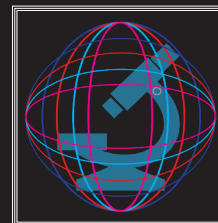
Kyanite is an interesting gem that can look remarkably like blue sapphire. With the prices of the latter rising substantially, it does provide a unique and in most cases, affordable option. The fact that it is a challenge to cut makes it an even more 'fascinating' gemstone.

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Photoatlas of Inclusions in Gemstones Volume 2 - John Koivula (Page 136)



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