

## BOOK REVIEW—FOR IMMEDIATE RELEASE

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*2012 Jewelers Guide to Treated & Created Gems*  
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By Jeffery Bergman

***Author's Note: The following review is being entered into the public domain. Feel free to distribute it to all your contacts in the gemstone, jewelry and appraisal industries.***

### Introduction

Early in 2012, the World Gem Society released a new guidebook aimed at educating what they refer to as “grass roots jewelers” in the gemological science of distinguishing natural gemstones from their treated and synthetic counterparts.

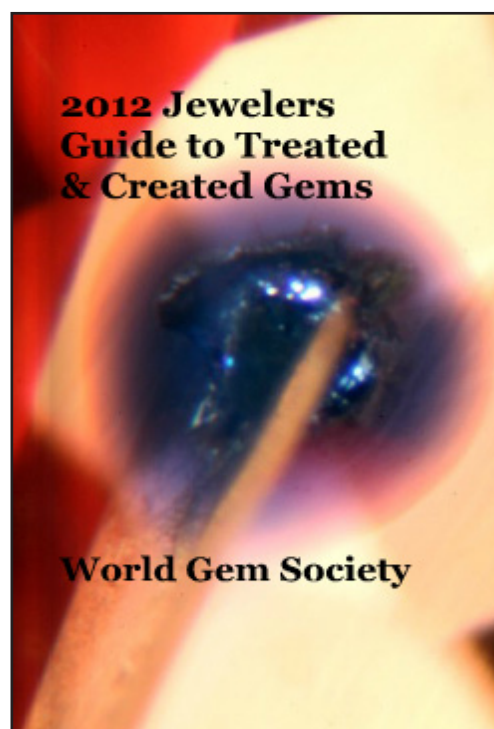
A handbook of this nature, providing practical and accurate methods for jewelers to differentiate natural from treated and synthetic gemstones, would be a valuable tool for our industry. Therefore, it is vital to gemologically scrutinize this publication before recommending it to the trade at large.

I am grateful to the WSG and YourGemologist for providing an online version of this book for review at the following URL:

<http://www.blurb.com/books/3050594>

All quotes and supporting photographic “evidence” in question taken directly from the *2012 Jewelers Guide to Treated & Created Gems* are highlighted in red. Immediately following are my conclusions with supporting references.

Note: The following represent my own personal opinions of the work under review. I leave it to readers to decide whether to trust my thoughts (backed up with citations from the gemological literature), or those of the author of the *2012 Jewelers Guide to Treated & Created Gems*.



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## Aquamarine: Color Infused – Page 12

2012 Jewelers Guide to Treated & Created Gems



Color infusion in aquamarine showing unusual color zoning.



The pink and blue colors are quite often found in color diffused aqua.

### Above left photo caption:

“Color infusion in aquamarine showing unusual color zoning.”

### Above right photo caption:

“The pink and blue colors are quite often found in color diffused aqua.”

### Primary Test:

“If you remember to view in all possible angles you will normally find a tell-tale color zone effect from the incomplete coloring process. Also, as with most diffused stones the residual colors of the flux will often be seen. In the case of the diffused aquamarine a slight pink tint has also been noted as seen above.”

### Incorrect

Naturally occurring color zoning can be found in aquamarine. Bi-color aquamarine with goshenite, bi-color aquamarine with morganite, and mixes of all three are found in nature. It is impossible to attribute a diagnosis of treatment from these photos.



Zoned and bi-colors are common in natural, untreated beryls.

### Citations

[http://blog.163.com/cf\\_mcc/blog/static/553855802011111093118349/](http://blog.163.com/cf_mcc/blog/static/553855802011111093118349/)

<http://www.minfind.com/mineral-19839.html>

## Aquamarine: Color Infused – Page 12

### Primary Test:

“As with all diffused gemstones, the color is never totally uniform.”

### Incorrect

Many beryllium treated sapphires have completely uniform color and are impossible to detect visually.

### Citations

“the coloring agent penetrates deeply and uniformly into the stone”

<http://www.thenaturalsapphirecompany.com/Education2/common-sapphire-treatments/diffusion-processes/>

“most of the Be-diffused yellow and orange samples were colored throughout, with less than 10% showing a layer of surface-conformal color”

Page 117, <http://lgdl.gia.edu/pdfs/su03a1.pdf>

## Diamond: Lab Created – Page 17

### Primary Test:

“There are a number of methods to separate most lab created gemstones from their natural counterparts due to variables in chemical makeup. These are not available with diamonds.”

### Incorrect

UV fluorescence is one of the methods used to detect trace impurities in synthetic diamonds which differ from natural diamonds. In other words, “variables in chemical makeup” are used to separate natural from synthetic diamonds.

[http://en.wikipedia.org/wiki/Synthetic\\_diamond](http://en.wikipedia.org/wiki/Synthetic_diamond)

<http://www.gci-gem.com/pdf/synthetic.man%20made%20and%20identification2.pdf>

## Malachite: Imitation – Page 34

2012 Jewelers Guide to Treated & Created Gems



Plastic imitation of malachite sold as natural from Hong Kong dealers.



Natural surface of slice of malachite from Zaire.

### Above left photo caption:

“plastic imitation of malachite.”

### Primary Test:

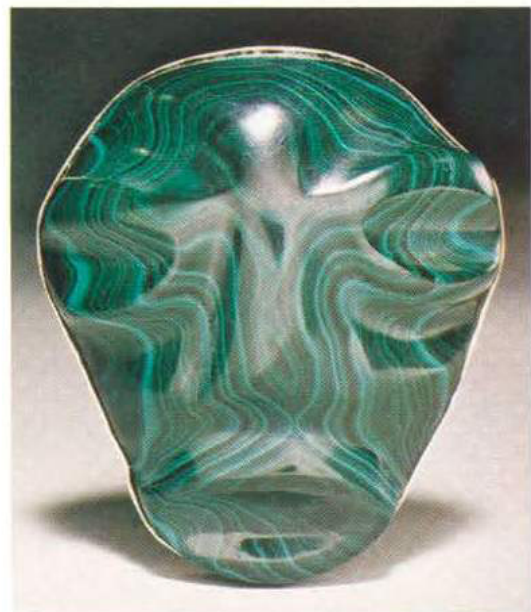
“the one on the left...looks more like color flow lines in glass, which essentially it is.”

### Incorrect

It is either glass, or it is plastic. It cannot be both.

### Citation

◇ Arem, Joel E. (1987) *Color Encyclopedia of Gemstones*, Page 289, Photo 133.



133. MALACHITE: Zaire (~ 4 inches high)

The upper left 2012 *Jewelers Guide to Treated & Created Gems* photo looks very much like the Joel Arem photo of natural malachite above (Photo 133).

## Syn. Moissanite: Lab Created – Page 35

### Primary Test:

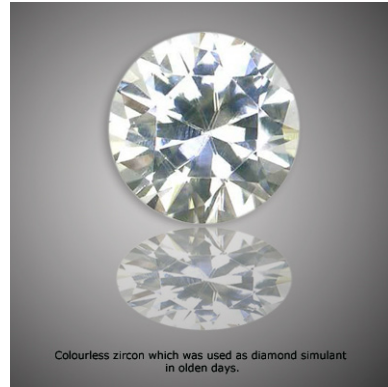
“Zircon has a far higher level of double refraction of the facet junctions, and the colors will not be the colorless to slightly greenish of synthetic moissanite.”

### Incorrect

Colorless zircon is common, and is described in virtually every major gemological text book. In fact it is one of the oldest diamond imitations known to man.



248. ZIRCON: Sri Lanka (blue = Cambodian) (~ 5-30 carats)



Colourless zircon which was used as diamond simulant in olden days.

Colorless zircons are common. Above left is one pictured in Arem (1987), while another is from all-gemstones.com

### Citations

- ◇ “Heating effects: Sri Lankan material becomes colorless”: Arem, Joel E. (1987) *Color Encyclopedia of Gemstones*, Page 208
- ◇ Zircon color range photo: Arem, Joel E. (1987) *Color Encyclopedia of Gemstones*, Page 316, Photo 248
- ◇ Colorless zircon is used as a diamond simulant.

<http://www.all-gemstones.com/zircon>

<http://www.gemologyproject.com/wiki/index.php?title=Zircon>

<http://www.diamondreview.com/tutorials/simulant-vs-synthetic-diamonds>

<http://www.rocksandco.com/?task=rocksBookSecond&action=ratanakiriZircon>

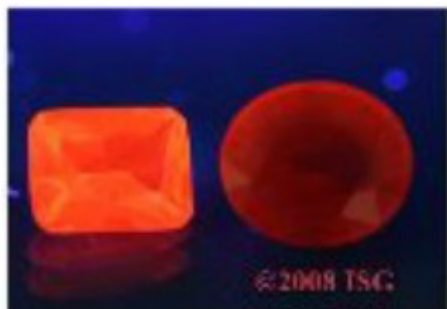
[http://www.geo.utexas.edu/courses/347k/redesign/gem\\_notes/Zircon/zircon\\_triple.htm](http://www.geo.utexas.edu/courses/347k/redesign/gem_notes/Zircon/zircon_triple.htm)

“For more than a thousand years, zircons have been recovered from the alluvial gem gravels of Sri Lanka. But it wasn’t until the late 18th century that a professor of chemistry from the University of Berlin, M.H. Klaproth, named the gem “zircon.” Klaproth, sometimes labeled “the father of physical chemistry,” discovered the elements strontium, titanium, and chromium. In 1789 he named the element zirconium and the gem zircon. He derived the name from the Arabic words “zar” and “gon,” meaning “gold color”—the color of most zircon samples at that time.

But it was colorless zircons that were sold in Indian bazaars as “Jargoons”—a corruption of “zar-gon.” They also were sold, sometimes deceptively, as Matara Diamonds. Because of their high luster and strong brilliance, colorless zircons have been used for centuries as imitation diamonds. The zircon labeled Matara (sometimes spelled “Matura”) Diamond is named after Matara, the largest city on the south coast of Sri Lanka. Matara was once considered the most important seaport for Sri Lanka’s spice and gem trade.”

Source: <http://www.jckonline.com/2003/11/01/cambodian-blue-zircon>





Strong fluorescence of lab created ruby above left shows difference.



A flame fusion boule of ruby with faceted gemstones.

**Above left photo caption:**

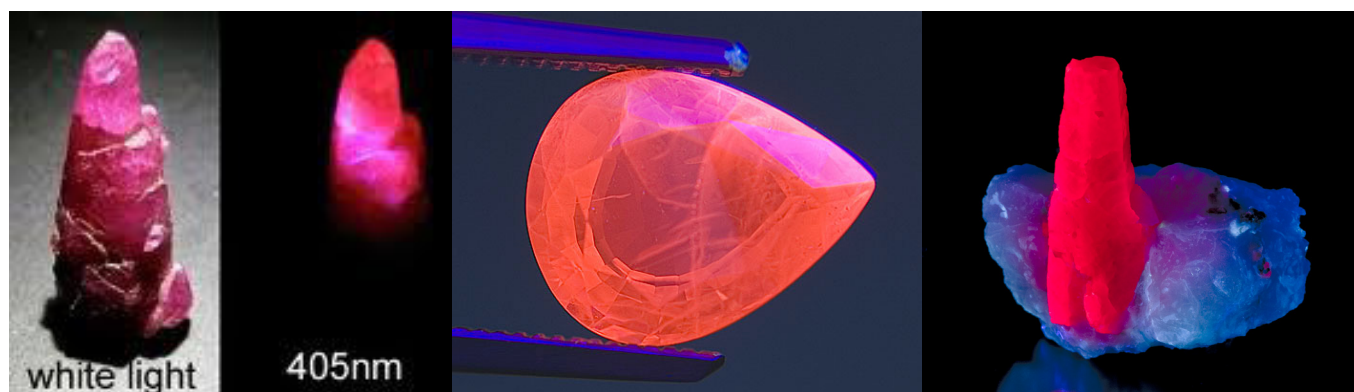
“Strong fluorescence of lab created ruby above left shows difference.”

**Secondary Test:**

“Natural rubies are generally much more subdued to UV light owing to the effect of natural iron to limit the reaction to UV light in natural rubies. The result is that a ruby with strong fluorescence should be considered potentially lab created, while a ruby with very faint UV reaction will have a tendency to be natural.....”

**Incorrect**

Natural ruby from many locations exhibits strong fluorescence, and synthetic Kashan ruby is muted or inert.



Vietnam Ruby

Burma Ruby

Afghanistan Ruby

**Citations**

Vietnam: <http://gemologyonline.com/Forum/phpBB2/viewtopic.php?f=13&t=13565&start=30>

Burma: [http://www.ruby-sapphire.com/heat\\_seeker\\_uv\\_fluorescence.htm](http://www.ruby-sapphire.com/heat_seeker_uv_fluorescence.htm)

Afghanistan: <http://www.irocks.com/render.html?species=Corundum&page=15>

UV Fluorescence of ruby is dependent on origin and/or iron content and can be strong to inert, red or orangey red

<http://www.bwsmigel.info/GEOL.115.ESSAYS/Gemology.ruby.html>

[http://www.geo.utexas.edu/courses/347k/redesign/gem\\_notes/Corundum/corundum\\_triple\\_frame.htm](http://www.geo.utexas.edu/courses/347k/redesign/gem_notes/Corundum/corundum_triple_frame.htm)

Because Kashan rubies contain varying amounts of iron oxide, their SW UV transmission factors overlap those of natural rubies.

<http://www.cigem.ca/inclusion/ru01.html>

“The Kashan was probably the first synthetic ruby to contain variable amounts of iron oxide. This invalidated the SW UV transparency test, and produced LW UV fluorescent and Chelsea filter results similar to those of the natural stone (i.e. muted or inert).”

*Gemmology*, Read, Peter G., ©1999

## **Ruby: Diffused Star – Page 54**

### **Repair and Setting:**

“No strong cleaning solutions and no high heat in an ultrasonic.”

### **Incorrect**

Synthetic ruby is inert to any cleaning solution found in typical jewelry stores. Also, they have already survived diffusion temperatures of 1300° Celsius or greater, so whatever heat an ultrasonic cleaner can generate will have no effect.

Rubies exhibiting six rayed stars are produced by heating with titanium oxide which diffuses into the host corundum surface. The development of asterism is achieved by heating the corundum to temperatures up to 1300° Celsius followed by a controlled cooling.

[http://www.geo.utexas.edu/courses/347k/redesign/gem\\_notes/Corundum/corundum\\_triple\\_frame.htm](http://www.geo.utexas.edu/courses/347k/redesign/gem_notes/Corundum/corundum_triple_frame.htm)

## **Sapphire: Color Infused – Page 61**



Immersion cell gives away the true origin of the color of this sapphire.



Blue sapphire that does not show any apparent treatment.

### **Above left photo caption:**

“Immersion cell gives away the true origin of the color in this sapphire.”

### **Incorrect**

The above left photo shows typical hexagonal color zoning common to natural corundum. It is impossible to attribute a diagnosis of treatment from this photo.



Color zoning which follows corundum's hexagonal growth pattern is common

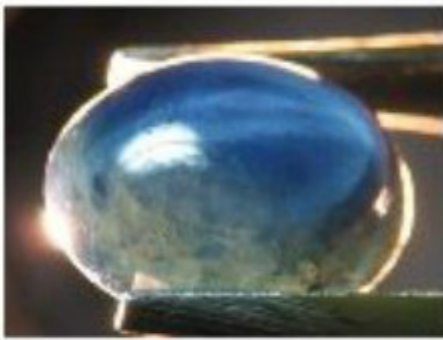
#### Citations

Photo #1. <http://www.gehnabazaar.com/gemstones/31/blue-sapphire.html>

Photo #2. <http://aussiesapphire.wordpress.com/nsw-sapphire/>

Also see: <http://www.corunduminium.com/>

#### Sapphire: Color Infused – Page 62



Cabochon showing incomplete color penetration of color infusion.

Above left photo caption:

“Cabochon showing incomplete color penetration of color infusion.”

#### Incorrect

This looks like just another color zoned natural sapphire. It is impossible to attribute a diagnosis of treatment from this photo.



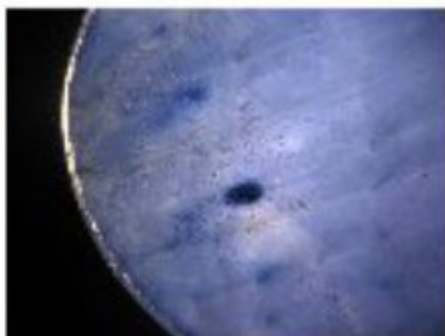
Natural bi-color sapphires, mine direct, Australia

## Citation

[http://www.aussiesapphire.com.au/VirtualTour/html/gems\\_11.html](http://www.aussiesapphire.com.au/VirtualTour/html/gems_11.html)

## Sapphire: Color Infused – Page 62

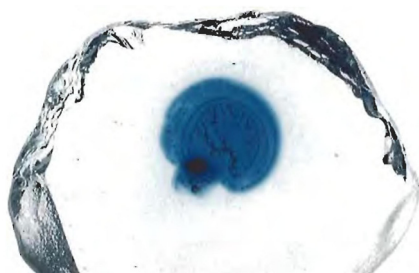
### & Created Gems



Sometimes the poor quality stones give us the best look at treatments.

### Page 62, Right side photo caption:

“Sometimes the poor quality stones give us the best look at treatments.”



Blue color bleeding from a titanium-rich crystal. This is a type of internal diffusion resulting from standard heat treatment, not lattice diffusion. Photo from Emmett.

## Incorrect

Dark blue spots are often attributed to naturally occurring titanium (from rutile inclusions) diffusing into the surrounding area causing blue color which develops during traditional heat treatment.

## Citations

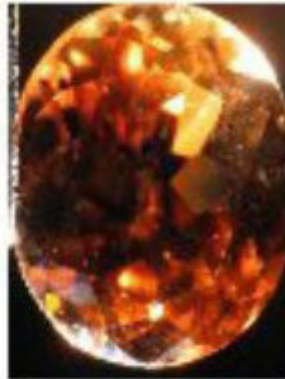
<http://gia.metapress.com/content/xx03n61610258363/fulltext.pdf>

<http://www.ruby-sapphire.com/pdf/Emmett-2011-Beryllium-and-Beefsteak.pdf>





Irradiation damaged topaz crystal.



Imperial topaz that is irradiated will show internal damage.

**Above left photo caption:**

“Irradiation damaged topaz crystal [sic].”

**Incorrect**

If this crystal were artificially irradiated, the entire crystal would have changed color, not just the openings at the bottom. The deeper color in these openings is likely due to the natural penetration of radioactive fluids in the ground. This is well documented in quartz: Koivula J.I. (1986) Solution coloration of smoky quartz. *Journal of Gemmology*, Vol. 20, No. 4, pp. 208–209.

**Above right photo caption:**

“Imperial Topaz that is irradiated will show internal damage.”

**Incorrect**

Topaz irradiated to produce “Imperial” colors is often loupe clean.



These two samples are loupe clean and were provided by yours truly, Jeffery Bergman. They are now in the hands of the GIA Laboratory, Bangkok, Thailand.

**Citations**

Topaz with Unstable Color, *Pala Gem News*, August 2007

[http://www.palagems.com/gem\\_news\\_2007\\_v2.htm](http://www.palagems.com/gem_news_2007_v2.htm)

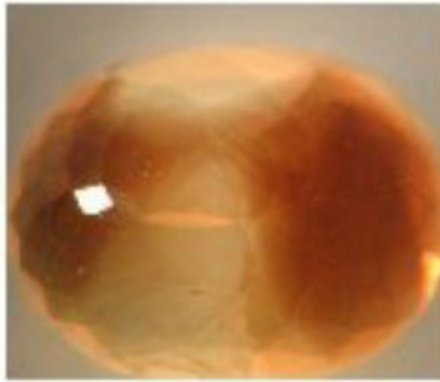
Topaz with Unstable Brown Color, *Gems & Gemology*, Fall 2007

<http://www.gia.edu/research-resources/gems-gemmology/issues/fall2009-contents/fall-2009-featured-gni.html>

## Topaz: Color Infused – Page 72



Color infusion is often done on rough which can be seen as zones.



Unusual color zoning is an important feature for identification.

### Above left photo caption:

“Color infusion is often done on rough which can be seen as zones.”

### Above right photo caption:

“Unusual color zoning is an important feature for identification.”

### Primary Test:

“The color infusion process causes the (topaz) color to be highly zoned and unusually formed.”

### Incorrect

Natural topaz can exhibit strong color zoning. There are even examples of natural bi-color pink and orangey Imperial topaz.



This natural topaz crystal was found by well-known Colorado collector George Fisher at Crystal Park, El Paso County, Colorado.



Bi-color topaz crystal from Ouro Preto, Brazil. “100% natural... no treatments or funny business that is usually the case with topaz. Picked up in person from one of the mines as soon as they come out of the ground...”



“Here’s a nice bicolor Topaz from Wolodarsk-Wolinskiy, Ukraine. It has very appealing color zoning with a blue center and reddish brown sides.”

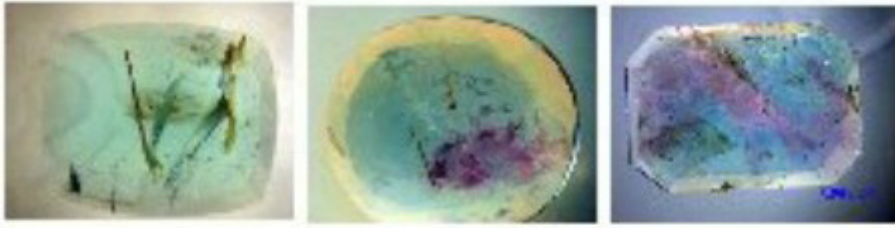
### Citations

<http://www.mineral-forum.com/message-board/viewtopic.php?t=1214>

<http://www.mineral-forum.com/message-board/viewtopic.php?t=1214>

<http://www.mindat.org/forum.php?read,17,241281,258642,quote=1>

## Tourmaline: Color Infused – Page 75



Blue dye material  
caught in fissures.

Red flux from infusion  
process remains behind

Color infusion is easy  
to see in this specimen.

### Above left photo caption:

“Blue dye material caught in fissures.”

### Above center photo caption:

“Red flux from infusion process remains behind”

### Above right photo caption:

“Color infusion is easy to see in this specimen.”

### Incorrect

The above photos show typical color zoning commonly found in natural Tourmaline. It is impossible to attribute a diagnosis of treatment from these photos.

### Citation

<http://www.ncbi.nlm.nih.gov/pubmed/20419294>



Photo 1



Photo 2

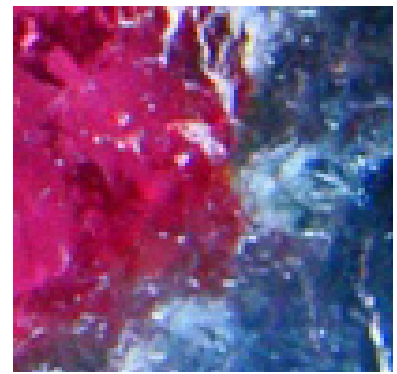
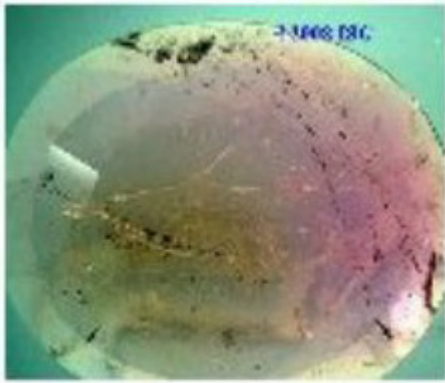


Photo 3

Immediately above are three photos, including close-ups, of an untreated tourmaline crystal. N.B. Intact host material.

### Citation

<http://www.flickr.com/photos/orbitaljoe/20314802/sizes/o/in/photostream/>



This stone is just messy from the color infusion process tearing it up.

**Above right photo caption:**

“This stone is just messy from the color infusion process tearing it up.”

**Incorrect**

This stone is “just messy” because it grew in the earth, and mother nature is responsible for “tearing it up” that way, just like so many other natural tourmalines. It is impossible to attribute a diagnosis of treatment from the above photograph. It looks like a typical moderately included natural tourmaline exhibiting pink, yellow and colorless zones quite similar to the specimen in the photo below.



The photo immediately above shows an untreated tourmaline crystal with color zoning and inclusions quite similar to the far upper right photo. N.B. Intact host material.

**Citation**

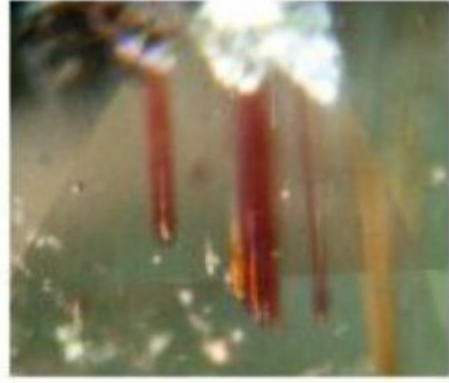
[http://blog.163.com/cf\\_mcc/blog/static/55385580201111093118349/](http://blog.163.com/cf_mcc/blog/static/55385580201111093118349/)



## Tourmaline: Color Infused – Page 76 & 77



The red and yellow filled tubes have become important identifiers.



Again, the red and yellow filled tubes have become diagnostic.

### Above photo caption:

“The red and yellow color filled tubes have become important identifiers.”

### Above lower right photo caption:

“Again, the red and yellow filled tubes have become diagnostic.”

### Incorrect

It is impossible to identify the composition of the material in the growth tubes and attribute a diagnosis of treatment from this photo. Composition of internal gemstone features are determined predominately by RAMAN spectrometry as it allows for non-destructive analysis of internal characteristics which are inaccessible to other diagnostic methods.

### Citations

<http://www.ncbi.nlm.nih.gov/pubmed/20419294>

<http://www.gia.edu/research-resources/news-from-research/copper-diffusion-tourmaline-update.pdf>

The following paper presents a geologically & gemologically sound explanation for red/pink coloration around growth tubes in natural tourmaline, given the knowledge of the coloration effects of irradiation on certain tourmalines.

### Lab Alert: GIA Reports Pink Color Around Growth Tubes in Copper-bearing Tourmalines Results from Natural Irradiation:

“In all instances where pink coloration was observed, the growth features surrounded by the pink color reached the surface of the stones. In cases where growth tubes did not reach the surface, no pink color was seen. When these pink zones were viewed down their length, the color was observed to bleed out into the surrounding tourmaline host, becoming weaker until it gradually faded away. If post-growth matter in the tube created a blockage, coloration occurred only to that point. Additionally, any cracks extending from or between the growth tubes also showed a pink color.

Radiation is known to produce pink-to-red color in tourmaline. The coloration of surface-reaching features in tourmaline by invading radioactive fluids has not been reported in the literature; however, there have been reports of both smoky quartz and green diamonds with coloration that was caused by exposure to naturally occurring radioactive fluids. This mechanism explains all the observations of pink and red in these tourmalines.

“Since radiation is the cause of pink color in tourmaline, the presence of these features should not be attributed to any type of intentional diffusion, but rather to the influx of radioactive fluids in their post-growth environment.”

#### **Citation**

<http://www.gia.edu/nav/toolbar/newsroom/news-releases/2009-news-releases/lab-alert-pink-color-growth-tubes-copper-bearing-tourmalines.html>

#### **Tourmaline: Color Infused – Page 77**



Clearly, this is red dye material caught in the growth tubes.

**Above left photo caption:**

“Clearly this is red dye material caught in the growth tubes.”

#### **Incorrect**

It is impossible to identify the composition of the material in the growth tube and attribute a diagnosis of treatment from this photo. Composition of gemstone inclusions is determined predominately by RAMAN spectrometry as it allows for non-destructive analysis of internal characteristics which are inaccessible to other diagnostic methods.

<http://www.ncbi.nlm.nih.gov/pubmed/20419294>

<http://www.gia.edu/research-resources/news-from-research/copper-diffusion-tourmaline-update.pdf>

## Tourmaline: Color Infused – Page 77

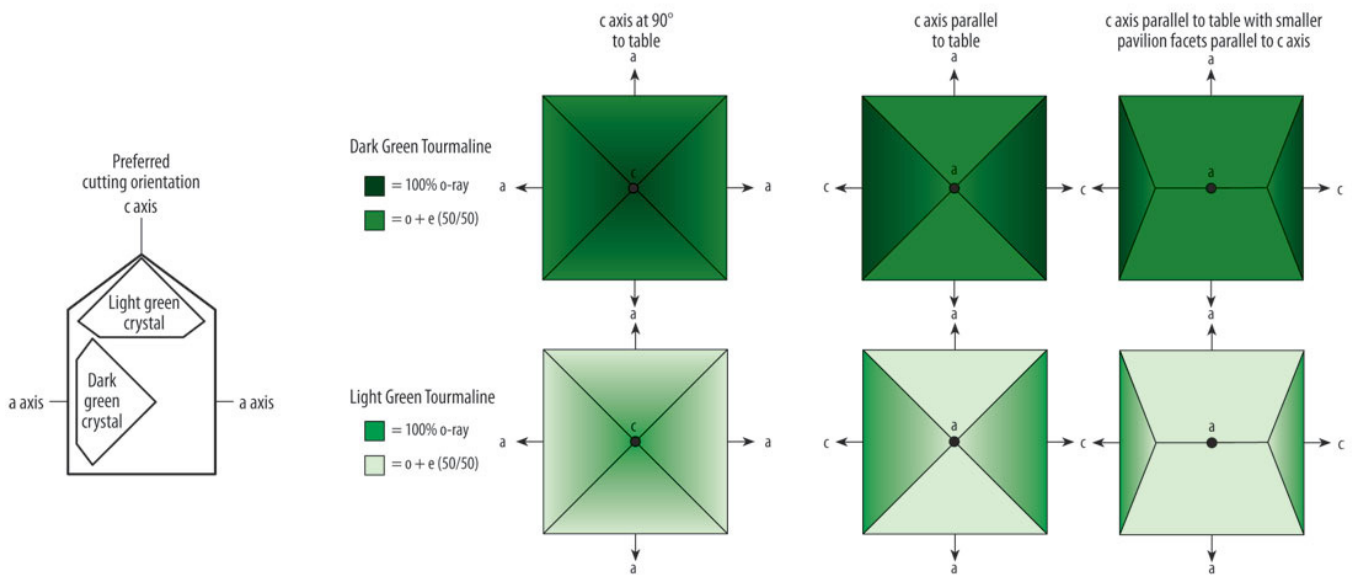
### Additional Important Information:

“When you find growth tubes in a tourmaline that are oriented perpendicular to the table and pointing straight up toward you when viewing the stone face up, this is a very strong indicator of a treated tourmaline.”

### Incorrect

In a book riddled with errors, this is perhaps one of the most obvious. The orientation of a gemstone is based on the cutter's anticipation of the face up appearance after cutting. Orientation of a cut gemstone is not an indication of treatment.

### Tourmaline Pleochroism & Cutting Orientation

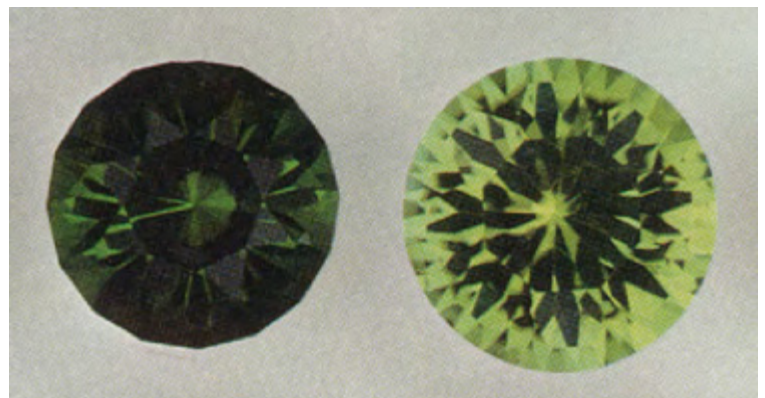


© 2009 Richard W. Hughes/www.ruby-sapphire.com

The cutting of tourmaline. Orientation is based on obtaining the best face-up color and has nothing to do with treatments.



“The effects of pleochroism can clearly be seen in this oval green tourmaline. Along the vertical axis, a bluish green color is seen, while along the horizontal axis, the color is yellowish green. This is a product of the doubly refractive nature of tourmaline.” Photo: Wimon Manorotkul



Two green tourmalines from Arem (1987; Plate 226). The stone at left is cut with the c-axis parallel to the table (and running horizontally; note the green 'bow tie'), in an attempt to lighten the color. The stone at right is cut with the c-axis perpendicular to the table; thus the color is deepest at the culet and becomes lighter towards the girdle, just as in the illustration above.

### Citations

[http://www.palagems.com/tourmaline\\_buyers\\_guide.htm](http://www.palagems.com/tourmaline_buyers_guide.htm)

<http://z11.invisionfree.com/gembusters/index.php?showtopic=359&st=150>

◇ Arem, Joel E. (1987) *Color Encyclopedia of Gemstones*, Plate 226.

## Conclusion

The 2012 *Jewelers Guide to Treated & Created Gems* by the WSG and YourGemologist LLC makes a broad range of claims unsupported by even a tiny portion of the gemological community. If one is to rock the boat in any field, it is crucial to provide supporting evidence. Sadly this book fails to provide even a single scientific reference beyond the in-house photos to support the wild charges made. The above examples barely scratch the surface; I could have cited many more ('color-infused' red, orange and green garnets, to name but three).

Unfortunately, rather than revolution and revelation, what I found in *Jewelers Guide to Treated & Created Gems* was simply page after page of slip ups and sloppy science. A handbook providing practical and accurate methods for jewelers to differentiate natural from treated and synthetic gemstones would be a valuable tool for our industry. In my opinion, *Jewelers Guide to Treated & Created Gems* utterly fails in its attempt to achieve that worthy goal. Moreover, it does a grave disservice to the entire field of gemology by spreading what I believe to be serious misinformation.

Once again, I am grateful to the WSG and YourGemologist LLC for providing an online version of this book for review at the following URL: <http://www.blurb.com/books/3050594>. We can only hope that the author will take these comments to heart and make the appropriate corrections in future editions. This is part of the beauty of print-on-demand. One can make near-instant corrections to a book. But only if one is willing to admit mistakes and learn from them.

Jeffery Bergman

April 2012

Bangkok, Thailand & Las Vegas, NV (USA)