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Tanzanite Trepidation II

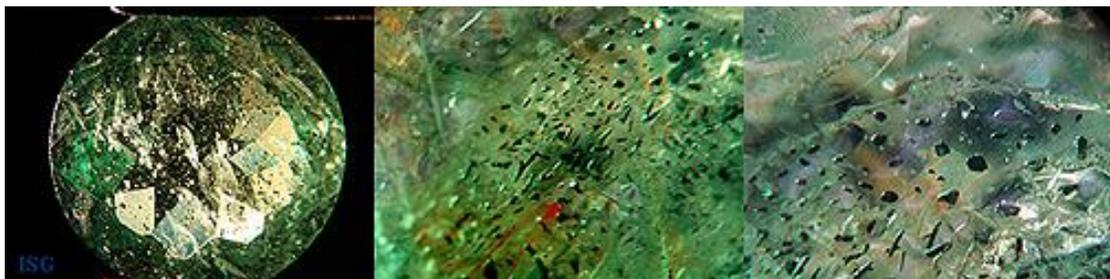
A follow up to our report on the color infusion of zoisite

Since our last report on this topic we have received several requests for updates to the information, particularly in the area of the annealed graphite and further evidence of the color infusion material inside the zoisite crystals. At issue is the potential that the graphite found on our stones could be due to the natural occurring graphite that is found in the area of the Merelani Hills where these specimens reportedly originated, and the issue of evidence regarding the color infusion material itself.

At the ISG we rely on a wide assortment of reference materials including geological and gemological reports and findings. But more important to the success of our research is the enormous expenditure that we make in obtaining actual specimens for study. More than anything else, our study group of specimens is responsible for the success of our research program as we buy more stones from more dealers from a wider market scope than any other organization. As such, we present the following update to our report starting with the issue of graphite.

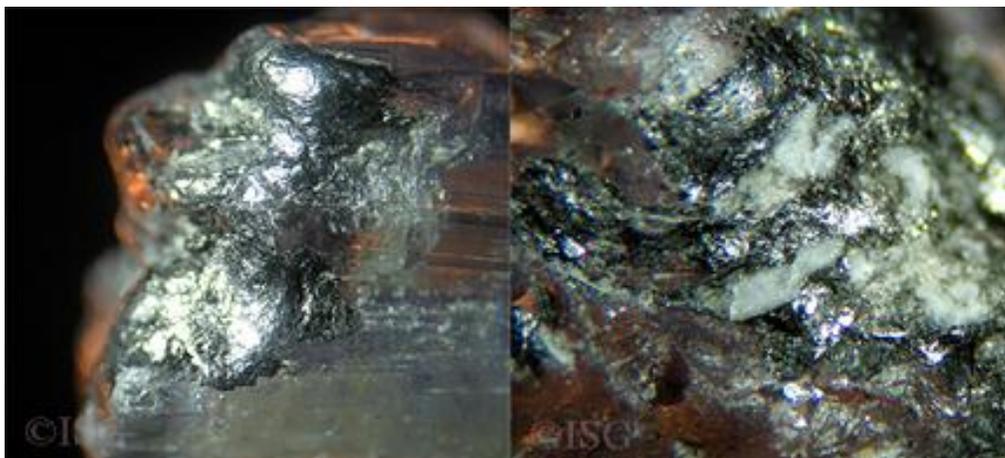
Annealed Pyrolytic Graphite

The image below was taken of a grossular garnet from the Merelani Hills area that we obtained from a dealer at the Tucson Gem Show 2 years ago. As seen with this stone and many of the tsavorite garnets from that area, the presence of naturally occurring graphite is actually one of the identifiers of a gemstone being natural and from this region. The graphite is of specific formation inside the gemstone crystal and serves as an important gemological identification tool in the evaluation of gemstones from this area.



However, if you notice the zoisite crystal in the center of the banner at the top of this report, the dark metallic looking substance that covers virtually the entire end of that crystal is also graphite, but in this case it is identified as “annealed pyrolitic graphite”, that is graphite that has been subjected to high temperatures.

Below is another image panel of the annealed graphite from some of these color infused tanzanites. Unlike the naturally occurring graphite inside the above gemstone, these crystals are totally void of any trace of the natural internal graphite. However, they are covered in areas with melted metal that tests as annealed pyrolitic graphite. Along with the graphite, we found fused white material that proved to be a combination of small quartz crystals and hardened sodium silicate, better known as **water glass**.



This graphite is obviously totally unlike anything that our natural Merelani Hills region gemstones show with their natural graphite formations, but we took this issue one step further.

During our testing of the Tibet andesine specimens from the Hughes/Schorr Expeditions we first noticed an anomalous Raman peak at 1355nm that was at the time unknown in our ISG database for our Enwave Raman regarding natural graphite. However, upon further research we found that the Journal of Chemical Physics ([J. Chem. Phys. 53, 1126 \(1970\)](#)) in a report published in 1970 presented a Raman peak for stress-annealed pyrolitic graphite that exactly matched our Raman scan on this material. In order to further confirm this we obtained verified specimens of annealed and non-annealed graphite crucibles used for the treatment of gemstones. By Raman comparison utilizing the information from the Journal of Chemical Physics and our control specimens, we were able to specifically match the graphite from the Tibet andesine of the Hughes/Schorr expeditions to the annealed pyrolitic graphite from our kiln annealed graphite crucible.



The graphite that we have found fused into the surface of these color infused zoisite (tanzanite) as seen at left exactly matches by Raman scan the annealed pyrolitic graphite as previously found in the Tibet andesine and kiln annealed graphite crucible.

The graphite that we have found fused into the surface of these color infused zoisite (tanzanite) as seen at left exactly matches by Raman scan the annealed pyrolitic graphite as previously found in the Tibet andesine and kiln annealed graphite crucible.

None of these specimens contain any internal graphite.

Color Infusion Material

The second area of follow up will be the photographic evidence of the color infusion material. The color infusion of gemstones is by no means a new treatment, nor was it discovered by this office. The color infusion of tourmaline was recently reported by the now defunct AGTA GTC and Dr. Lore Kiefert in a report from National Jeweler available at this link: [National Jeweler: AGTA Alert for Dyed Tourmaline](#). Indeed, the artificial color enhancement by the infusion of coloring elements has been known for decades, if not centuries. This term: **Color Infusion**, is what we believe to be the best description of this treatment as we believe that the methods of color infusion are varied based on specific gemstone requirements, in spite of the end result being very nearly the same. This term was first presented to us by [Michael Cowing of ACA Gem Laboratory](#) who is well known for consumer protection and gemological research.



Perhaps the most important issue regarding our research on this topic is that the several years of litigation over the Tibet andesine matter allowed us to develop a simple but effective protocol of methods to identify color infusion when certain features are found.

At left you see the now famous “Red Dagger”, which ended the run of the Tibet andesine fraud. In high magnification the treatment damaged tube full of red color infusion material became the death knell for this multi-million dollar fraud perpetrated on consumers. And as with other gemstones such as tourmaline, we find that in certain specimens we are able to identify the

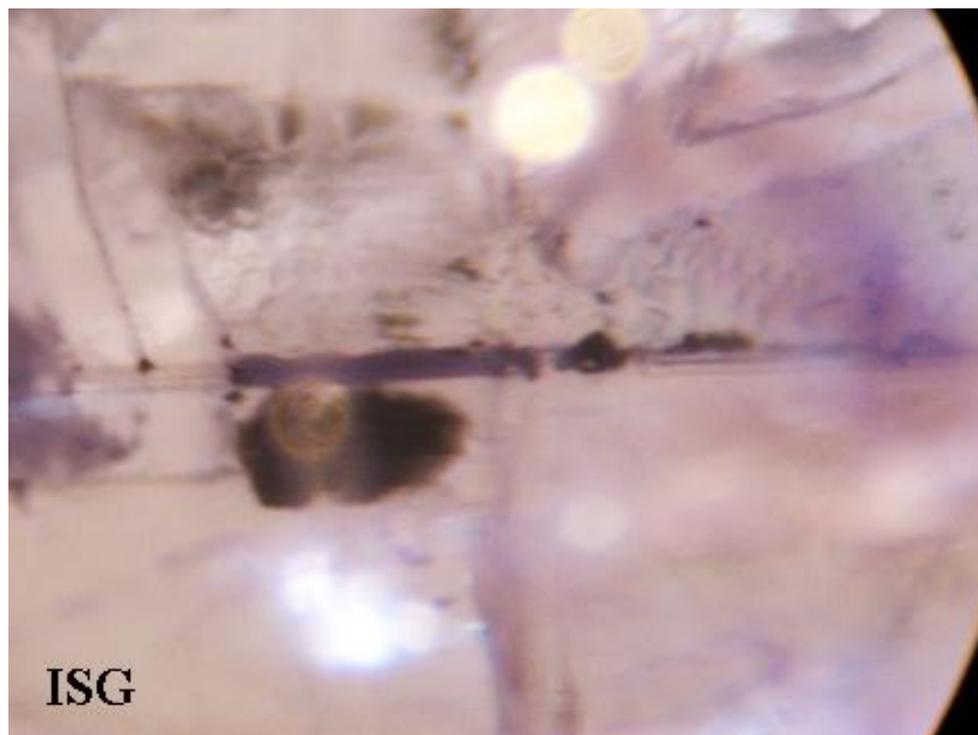
color infusion treatment specifically because the color infusion material tends to congregate in these open tubes. While the color infusion process can impart an artificial color that can be fairly uniform to highly zoned making identification difficult in some cases, the presence of these treatment damaged tubes filled with color infusion material has proven to be diagnostic for the treatment having been done to the stone.

Below is a 90x image of a damaged tube inside one of our color infused tanzanites clearly showing the presence of the purple coloring material in the tube. However, as with all of our research on this topic we do not rely on a single specimen, but rather obtain many specimens to look for a repeatable and predictable feature that will serve to verify our findings.



Below is a specimen that was previously tested and reported in the World Gem Society publication that is supported by the ISG. Below left you can see what is claimed to be a “Mardi Gras Tanzanite” from the Merelani Hills. You will note immediately that the yellow area on the left end already has an anomalous appearing section in the colorings.

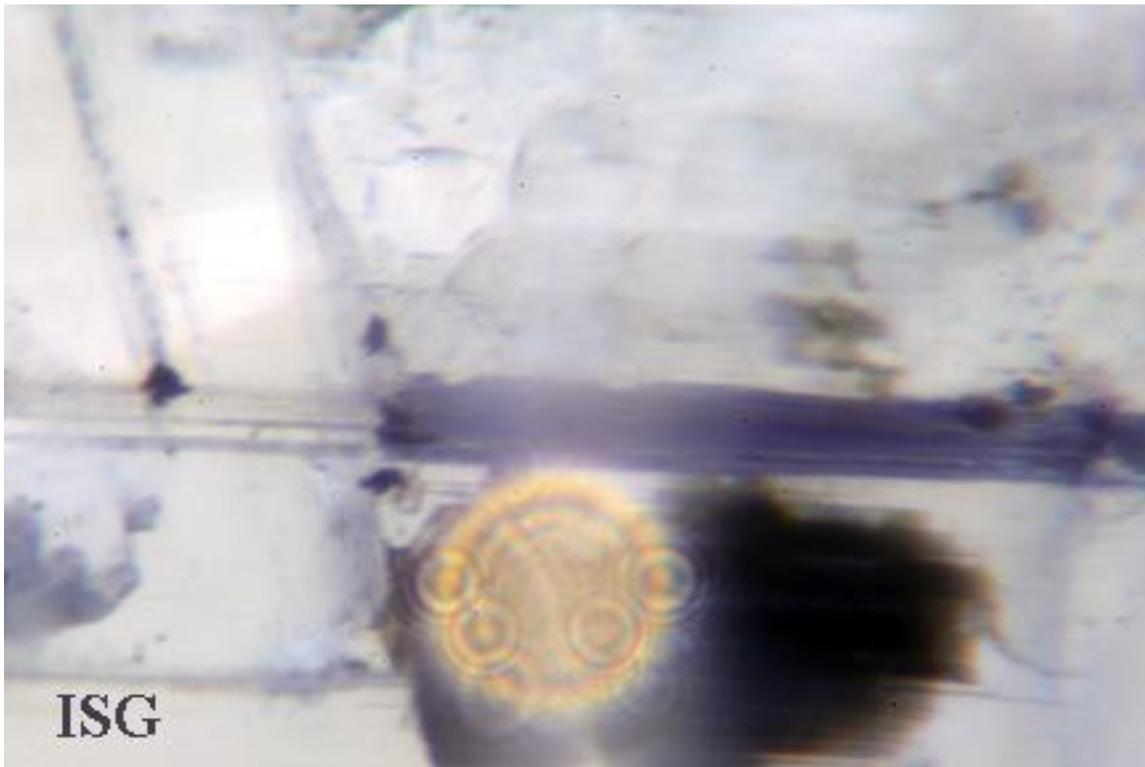
Below right you see the result of high magnification of this area. The yellow color is obviously due to a foreign substance in the stone, we believe this is a flux material of some type. But broken into this area and along the predicted path of a fracture in the stone, you see the purple coloring material from the color infusion process. Over the past months we have had several professional tanzanite dealers inspect these images and none could explain the features below by anything other than some kind of artificial color treatment.



Finally are the two images at left and below. At left, at 90x, this image clearly shows one of the internal tubes inside this zoisite that is partially filled with purple color material. At the right end of this image the purple color can be seen extending into the crystal.

Natural tanzanite is not colored by purple liquid material. This otherwise colorless zoisite is colored by this purple liquid material that you see at left, clearly congregated inside this internal tube.

And below is this same feature at 120x using our Meiji Techno microscope and Canon XTi Digital SLR. This is this same internal tube in this purple zoisite, sold as natural tanzanite, showing the purple coloring material partially filling this tube feature.



As previously stated, the color infusion of gemstones is by no means a new treatment, nor was it discovered by this office. The report of artificial coloring of gemstones by use of dyes and a variety of unknown materials is ubiquitous throughout the history of gemstones.

However, the ability to infuse these coloring elements into a gemstone on a nano level is something that we have only seen on the market within the past decade or two.

We have a more complete review coming out on this topic before the Tucson Gem Shows that will re-publish our independent scientific lab reports using LA-ICP-MS, XRF, SEM and other testing methods that verified the above information.

As always, we welcome professional review, inspection and suggestions regarding this work.

Robert James
President, International School of Gemology

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