Kyanite Treatment Evaluation

An evaluation of kyanite and possible color treatments........

Over the past few years we have learned that anytime a previously limited gemstone material becomes widely available on the market, that this is cause for serious investigation. Had this been done by the AGTA and others on the andesine issue a multi-million dollar fraud could easily have been avoided. Today, we have been asked to investigate the rather sudden appearance of gem quality kyanite on the market in numbers that cause a certain amount of alarm. As it turns out, alarms are well placed but not necessary. While we have identified treatments of kyanite, the overall picture appears to be quite healthy for this rather new…but still old….gemstone.

As you can see above, kyanite forms in long spire-like bladed crystals. The massive group that you see above right has been in the ISG Student Reference Collection since our inception, and in my personal possession since my days as founder of the Caribbean Gemological Institute. The faceted kyanite above left was donated to the ISG by our friend Bear Williams of Stone Group Labs. Both have been around our offices for quite some time and are known to be all natural and without treatments. These have served to allow us an accurate comparison and evaluation of kyanite obtained by the ISG on the open market.

The Study Group

As we always require, the ISG Gemstone Treatment Reports are performed on a myriad of specimens purchased on the open market from dealers we do not know, and who are not aware, that the specimens are being obtained for study. This allows us a true, blind study evaluation of the gemstones on the market. No other gemological lab in the world spends the amount of money or follows the strict protocol of the ISG when it comes to gemstone treatment research.

For this kyanite study we obtained over 300 specimens of crystals, cutting rough, beaded, and faceted kyanite from 20 dealers located in 8 different countries.
The Study

We first found that no current text book lists the UV-VIS-NIR spectrum of kyanite. GEMS by Webster (Butterworth Heinemann, Oxford UK 1994, pp. 348-349) listed lines in the red and blue ends of the spectrum, but the specific absorption lines and wavelengths were not listed in any reference book we reviewed. So, we used our new MDM Spectrometer to document that absorption spectra of kyanite in the UV-VIS-NIR.

For this purpose we broke out three blades of kyanite from the massive group crystal formation from our collection. These were separated and used as the test specimens since they have been in our collection for years, and coming from a massive crystal group in matrix we had high confidence of a completely untreated test group to establish our benchmark spectrum.

At left you can see the images of these test specimens and the test in action. Below is the resulting spectrum as a composite. The MDM Spectrometer allows us to visually and digitally document the significant absorption lines as outlined by Webster. Below left are the absorption lines in the 430nm and 446nm. Below right are what we found to be two classic transmission lines at 688nm and 705nm, just at the high range of the VIS spectrum and slighting into the NIR. This UV-VIS-NIR spectrum become critical in our examination of our specimen study group. Based on this information, and our Enwave Raman Microscope scanning, we were able to confirm that all specimens you see below are indeed kyanite.

Upon visual inspection of one of our control blades, we found what appeared to be flaking of the coloring from the surface of the kyanite. This had the appearance of a poor quality mystic topaz type surface coating that was flaking off the stone, and was the source of concern for a color treatment of kyanite. However, given that this was part of our matrix group that has been in our possession for over 15 years, and came directly from the matrix group, we ascertained that this must be a natural structure of the kyanite colors. And that the blue coloring of kyanite is due to a formation of an impurity that creates this structure that is natural for kyanite, in spite of appearing otherwise if seen in other varieties of gem materials. Images below left and right.
Over the past few months of our gemstone treatment research, we have found that the London Dichroscope from the Gem-A is a critical piece of equipment for the identification of certain treatments. Not the calcite dichroscope, the London Dichroscope. The reason, we believe, is that the London Dichroscope allows for a much broader view of the gemstone area and therefore allows for a much wider and more diverse view. It's sort of like looking so close to a forest that you cannot see the trees. Same applies with this concept. The London Dichroscope lets you see the whole forest while the calcite dichroscope only allows one to view a single tree. This is paramount in the identification of many treated gemstones based on our research.

As you can see at left, the flaky appearance of the coloring of this kyanite crystal can easily be seen using the London Dichroscope. This is not visible with a calcite dichroscope and would be missed. This, however, is a 10x image of one of our natural kyanite crystal blades from our control specimen group. The blotchy color appearance of this stone in one side of the London Dichroscope is a natural color formation for kyanite. It should not be confused with some form of surface treatment as we see in mystic topaz and others.

In this new crystal specimen that we obtained for our study, the dramatic dichroism of kyanite is quite visible. Also visible is the blotchy pattern of the coloring of the gemstone crystal. The long color patterns in the stone are also classic for kyanite and a mark of a natural, untreated kyanite gemstone.
In darkfield lighting this faceted blue kyanite of 4.25 carats appears quite color zoned. This is a classic pattern of natural kyanite that generally appears in either an immersion cell or in darkfield lighting. The stone appears a very pleasing blue color in normal ambient light. But this stone serves to demonstrate the beautiful pleochroism of kyanite that is rather unique in the gemstone world and sets kyanite apart as a very unusual gemstone.

At left you see this same kyanite demonstrating this dichroism through our London Dichroscope. The intensity of the cobalt blue color and the sky blue to colorless side is profound. We found that this is a classic result of kyanite to the London Dichroscope based on the directional properties of kyanite. The trichroic nature of kyanite makes for some very interesting viewing and study of pleochroism in general.

We found that the dichroic reaction of kyanite through the London Dichroscope can make for a fast identification of the material. While iolite will also show a blue to colorless reaction to the London Dichroscope, kyanite shows a colorless to dark cobalt to greenish blue in many specimens and at different viewing angles.

Below is our faceted kyanite and crystal once again demonstrating the pronounced pleochroism of the cobalt blue, near colorless, and green. This verifies this stone not only as kyanite, but also of natural color.

**Undisclosed Treated Kyanite**

We did obtain several specimens that have been artificially treated for color. Owing to the very porous nature of the kyanite crystal structure a dyefusion of the stone is quite easy to
accomplish. In fact, too easy. In over 100 specimens that we inspected the color dyefusion was so profound that identification is quite easy using nothing more than 10x magnification. As you can see below, this effort by Chinese dealers is easily identified as a bad dye job. Due to the very porous nature of kyanite the dye material flows too easily and gathers in very unnatural looking formations inside the stone.

Green is not the only color being tried for kyanite dyefusion. Below you see a failed effort at a blue dye job that then used green. While this treatment is easy to identify now, it must be assumed if the Chinese treatment industry follows their known course of action they will continue to improve on this issue to create a more viable, although as usual undisclosed, color treatment of kyanite.

The one verifiable issue we did identify on the color treated kyanite is that the 688nm - 705nm transmission lines were grossly engorged and became absorption lines. At left you see this area of the VIS-NIR spectrum of these color treated kyanite. We do not know at this time if this is the result of some preliminary treatment used to enhance the dyefusion of the stone, or if this is simply a by-product of the dying itself. Either way, we found this unusual spectrum to be present in virtually all of our dyefusion treated kyanite from China.

The Conclusion
Kyanite is a very unusual, beautiful and upcoming gemstone. For all but the above shown dyed kyanite that is easily identified, we found that the overall result of our study is that kyanite on the market is generally not treated based on all conditions present at the time of our study. This, of course, is always subject to change. But using using the technics and information we have provided above the verification of natural kyanite should be fairly easy on even the most basic of gemological levels. Likewise the identification of the dyefused treatment of kyanite should also be a matter of magnification and a bit of Old Geezer Rule application.

We urge everyone to study the directional properties of kyanite before attempting to cut the material. The directional properties for color and hardness require that a careful study be done before cutting. But kyanite is a relatively new gemstone on the market, in spite of it being around for years in various forms. It offers some beautiful and unique color properties and can be an excellent addition for any gemstone lover's collection.

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