Gem Trade LAB NOTES

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Brazilian ALEXANDRITE

All three locations of the GIA Gem Trade Laboratory have recently had the opportunity to examine a number of cut alexandrites from the new find in Minas Gerais, Brazil. The stones examined to date have ranged in size from 0.20 to 6 ct. While we do not know the extent of this deposit, there have been reports of substantial quantities of rough. The color change of most of the stones examined thus far is reminiscent of fine Russian alexandrites: from green to bluish green in day (or fluorescent) light to purple to reddish purple in incandescent light. Photos in the Gem News section of the Summer 1987 issue of *Gems & Gemology* show this change very nicely.

The properties of these stones are consistent with the published properties for alexandrite. Those the lab has seen show a very strong red transmission and a weak red ultraviolet fluorescence. Inclusions range from typical "fingerprints" and large transparent and white crystals to groups of bright stringers of tiny inclusions, very similar to those found in some flux-grown synthetic rubies. These are best seen with fiber optic illumination. Some of the stones are very clean.

The lab has also examined a few cat's-eye alexandrites from the same locality. Most exhibit the same fine color change and a well-defined, but not exceptional, chatoyancy. Apparently the silk responsible for the chatoyancy is not fine enough to create a top-quality cat's-eye effect. The largest of the cat's-eye stones we were shown was approximately one carat. *Shane McClure*

Editor's Note: The initials at the end of each item identify the contributing editor who provided that item.

DIAMOND

Highly Radioactive Green Diamond

Green diamonds are a continuing problem for jewelers and gemologists. For many stones, it is difficult, if not impossible, to determine whether the color has been produced artificially by irradiation or is natural. However, radium-treated diamonds, though rarely seen in recent years, are readily detectable with relatively simple tests. Dark green stains are usually visible on the facet surfaces of the stone when examined with magnification. In addition, these stones are weakly to moderately radioactive and can therefore be detected by a Geiger counter. Radium-treated diamonds will also produce an autoradiograph (i.e., take their own photo from the radiation they give off) when placed in contact with a piece of photographic film for a period of time.

A 2.67-ct green marquise-shape brilliant-cut diamond that was recently examined by the New York laboratory displayed small dark green color concentrations when viewed with magnification (figure 1). The radiation detector indicated an unusually high level of radioactivity, 70 millirems per hour; the radiation rate for radium-treated diamonds we observed in the past usually ranged from 1 to 10 millirems per hour. Whereas we normally must leave a radioactive diamond on the film overnight to get an image, this stone produced an autoradiograph (see figure 2) in only an hour! One possible explanation is that this stone was only recently subjected to radium

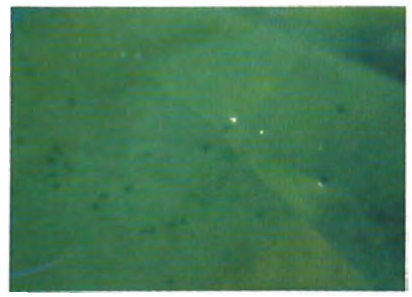

Figure 1. The dark green stains seen at 40× magnification on this 2.67-ct green diamond indicate that the stone has been radium treated.

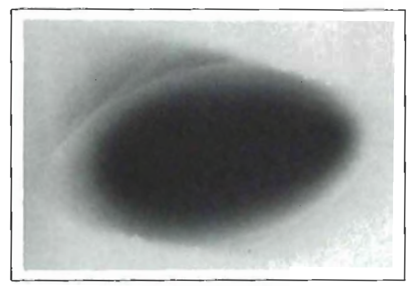

Figure 2. The radioactivity of the 2.67-ct green diamond produced this autoradiograph in only one hour.

irradiation. The last stone we reported with a relatively high level of radioactivity (40 millirems per hour) was noted on page 304 of the Summer 1968 issue of *Gems & Gemology*.

Although there are no official guidelines for the use of radioactive stones in jewelry, we strongly recommend against it because of the potential health hazard to the wearer.

David Hargett

Treated Yellow Diamond with Cape Lines

A 1.09-ct yellow round brilliant–cut diamond (figure 3) was submitted to the New York laboratory for determination of the origin of the color, which at first glance appeared to be in or near the fancy intense yellow range. This stone fluoresced a weak, somewhat chalky greenish yellow to long-wave ultraviolet radiation and had a similar, but weaker, reaction to short-wave U.V. radiation. When examined with our standard spectroscope unit, the stone displayed a strong Cape series of absorption lines. However, a 498-nm and 504-nm pair, plus a vague smudge at 594 nm, were also seen. Strong Cape lines ordinarily indicate natural origin; however the suspicious fluorescence and the lines at 498 nm and 504 nm indicated a need for further testing.

Figure 3. Although this 1.09-ct fancy intense yellow diamond showed the Cape series of lines in its absorption spectrum, further testing proved that it had been irradiated and annealed.

Figure 4. The linked ring design in which these earrings are carved is rarely seen in such fine quality natural-color jadeite jade.

Consequently, the stone was chilled with liquid nitrogen and tested with a spectrophotometer. The same absorption peaks were observed, but the 594-nm peak was now very definite. This confirmed that the stone had been treated by irradiation and subsequent annealing to improve its color.

Many treated yellow diamonds in the fancy color range that are submitted for testing show a weak Cape spectrum in addition to the lines that prove treatment; the presence of the Cape series of absorption lines indicates that the stone was originally very light to light yellow in color. However, the strength of the Cape series in this particular stone suggests that it was probably a fancy light or fancy yellow to begin with, but had been treated to make it even darker and thus fall into the more desirable intense-yellow range.

Clayton Welch

Jadeite JADE Earrings

The Los Angeles laboratory recently examined the spectacular "Imperial" jadeite jade earrings shown in figure 4. Each earring consists of two translucent rings carved from a solid piece of jade so that they are linked together chain style. The largest ring measures approximately 18.6 mm in outside diameter, 7.2 mm wide, and from 2.8 to 3 mm thick. The two rings are suspended from a third carved ring-shaped piece that is fitted with a yellow metal screw-back mounting, and set with five round brilliant–cut diamonds.

The earrings were proved to be natural-color jadeite jade on the basis of their properties: a 1.66 spot refractive index, an aggregate reaction in the polariscope, and a strong 437-nm band with strong chromium lines in the absorption spectrum. The pieces were inert to ultraviolet radiation. An uneven color distribution was easily visible with magnification, as was the fine crystalline aggregate structure. However, both were much less noticeable with the unaided eye.

The most interesting feature of these earrings is the fact that such fine-quality green jadeite was used to create a linked ring design. It has been our experience in the laboratory that usually only nephrite jade or less expensive colors of jadeite are carved in a link design, presumably because so much material is lost with this type of carving. *RK*

Figure 5. The color in these cultured pearls was produced by dye.

PEARLS

Black Cultured Pearls

The New York laboratory was recently asked to identify the single strand of black cultured pearls illustrated in figure 5. There were 61 pearls on the strand, ranging in diameter from approximately 11 to 14.2 mm. At first glance, they appeared to be the expensive natural-color cultured pearls that come from the Tahiti area.

However, the X-radiograph of this same strand showed the reversal pattern that is typically seen when a silver nitrate dye has been used. Because metallic silver deposited from the silver nitrate dye solution is opaque to X-rays, it shows up as a white ring on the X-ray. Conchiolin, transparent to X-rays, normally shows up as a black ring.

Another proof of treatment is the fact that natural-color black pearls fluoresce a dull orangy red to red when exposed to long-wave ultraviolet radiation, while dyed black pearls do not fluoresce at all, as was the case here. These pearls may have been off-color South Seas pearls that were dyed to make them more salable. *David Hargett*

An Unusual Use for a Natural Pearl

The Santa Monica laboratory was asked to identify a fairly large button-shaped pearl, measuring approximately 18 mm in diameter by 13 mm deep, that was quite ingeniously used in a jewelry item. A watch is set into the pearl which is suspended from a detachable white metal swivel pendant set with small diamonds. This assemblage is in turn suspended from a white metal bow pin set with numerous diamonds of various shapes and sizes. Figures 6 and 7 show the front and back of this unique piece.

The pearl did not fluoresce to X-rays, which indicates saltwater origin. An X-radiograph taken through the side of the pearl showed structural characteristics indicative of a hollow natural pearl. However, because of the size of the watch set into the pearl we could not determine if the pearl is a natural hollow blister pearl or a natural button pearl that has been hollowed out at its base to accommodate the watch. *KH*

Scenic QUARTZ

Although we frequently encounter chalcedony (the cryptocrystalline variety of quartz) with inclusions of a scenic nature, we seldom see crystalline quartz with such picturesque inclusions. A reader from Massachusetts very kindly sent such a stone to the Santa Monica laboratory for our observation and to be shared with readers of this column.

The photo (figure 8) does not do the stone justice because the scene is actually three-dimensional. Still, it does not take much imagination to visualize dust storms swirling across a rolling desert with a mountain in the background. The jasper-like inclusion causing the scene cuts through the stone from the first row of facets above the girdle to the opposite side of the culet, following the general direction of the pavilion facets, thus giving the three-dimensional effect when the stone is viewed from the top.

The 43.36-ct gem is a slightly milky, very translucent, almost transparent variety of quartz. The refractive index is approximately 1.545, with very little discernible birefringence. The specific gravity, estimated with heavy liquids, is approximately 2.65. A bull's-eye optic figure was resolved in the polari-

Figure 6. The front view of this unusual natural pearl pendant gives little evidence of the watch that has been set into the other side of the pearl.

Figure 7. This rear view of the pendant in figure 6 shows the watch that has been set into the pearl.

scope. The stone was inert to ultraviolet radiation. *CF*

Heat-Treated Yellow SAPPHIRE

A beautiful orangy yellow oval mixed-cut stone weighing 7.60 ct (figure 9) was submitted to the Santa Monica laboratory for identification. The refractive index, birefringence, and optic figure proved that the stone is sapphire. Microscopic examination revealed natural inclusions as well as the strain discs, very fine dot-like "silk," and round cotton-like inclusions that are indicative of heat treatment.

Exposure to short-wave ultraviolet radiation revealed three zones of chalky blue fluorescence close to the girdle, another sign of heat treatment. When the stone was immersed in methylene iodide, some interesting structural characteristics became visible. In addition to the straight angular yellow color zoning alternating with near-colorless areas, which is characteristic of natural origin, three straight blue zones close to the girdle (coinciding with the areas of chalky blue fluorescence) were seen. Figure 10 shows these blue areas, which could be the result of the heat treatment. *KH*

Figure 8. Inclusions in this 43.36-ct faceted slightly milky quartz have produced an unusually picturesque three-dimensional scene.

Cat's-Eye SILLIMANITE (Fibrolite)

The mineral sillimanite was named after Benjamin Silliman, a Yale University mineralogist. It has also been called fibrolite, in allusion to the fibrous nature of the cat's-eye variety.

Sillimanite, an aluminum silicate (Al_2SiO_5), is polymorphous (the occurrence of two or more different crystal forms having the same chemical formula but with different atomic structures and therefore different properties) with kyanite and andalusite. Sillimanite itself is a rare collector's stone; cuttable gem-quality chatoyant material is extremely rare. However, cat's-eye sillimanite has been found in the gem gravels of Sri Lanka, the Mogok region of Burma, and, more recently, in Kenya.

Figure 9. This 7.60-ct yellow sapphire was found to be heat treated.

Figure 10. Blue color zones observed at the girdle of the yellow sapphire shown in figure 9 fluoresce blue to short-wave ultraviolet radiation. Magnified 3×.

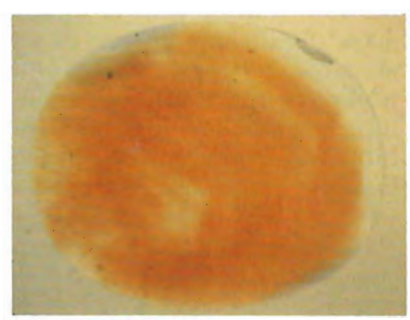

Figure 11. Cat's-eye sillimanite is very rare; this stone weighs 3.44 ct.

The Los Angeles laboratory recently had the opportunity to study the 3.44-ct cabochon shown in figure 11, a translucent to opaque very dark brown, almost black, cat's-eye sillimanite. Spot readings revealed refractive indices of 1.66 and 1.68, with a birefringence of 0.02. The stone was inert to both short- and long-wave ultraviolet radiation. Our standard spectroscope unit revealed a moderately dark general absorption up to about 490 nm, with a broad dark band superimposed at 440 to 450 nm. The specific gravity was estimated by the use of heavy liquids to be approximately 3.2.

It is interesting to note that another dealer who specializes in Sri Lankan gemstones was offering several cat's-eye sillimanites for sale at the 1987 Tucson Gem & Mineral Show, an extremely unusual display given the rarity of these stones. His pieces ranged in weight from approximately one-half to three carats and included near-colorless, violet, brownish green, and gray hues, as well as a very dark brown, almost black stone, similar in color to the stone the lab examined. *RK*

A Brownish Gray TAAFFEITE

The Los Angeles laboratory recently identified a 0.61-ct faceted taaffeite with the very unusual brownish gray color shown in figure 12. The stone was inert to both long- and short-wave ultraviolet radiation, gave refractive indices of 1.720 and 1.726, and showed a uniaxial optic figure in the polariscope. No absorption lines or bands were observed when the stone was examined with our standard spectroscope unit. Microscopic examination revealed inclusions that have previously been seen in taaffeite: a large group of very well developed pseudohexagonal prismatic crystals, a whitish "fingerprint" of negative crystals, and a few bright reflective fractures.

Although taaffeite occurs in other colors, it is usually purple to violet, with a range of saturation levels. This is the first brownish gray taaffeite we have encountered in the lab. *RK*

Figure 12. This 0.61-ct stone is the first brownish gray taaffeite ever seen at the laboratory.

A Rare Green Cat's-eye Chrome TOURMALINE

Figure 13 shows a rare green cat's-eye chrome tourmaline that was recently examined by the New York laboratory. This is the first cat's-eye chrome tourmaline of this color seen by the New York lab.

Figure 13. The rare 3.32-ct green cat's-eye chrome tourmaline shown here is reportedly from Tanzania.

Our client informed us that this material was first found in the 1960s at the Landanai mine in the Umba River area of Tanzania. Apparently only a small part of the tourmaline production is of gem quality, and most of this material is faceted; cat's-eye rough has been very rare. The needles that cause the chatoyancy in this grayish green 3.32-ct stone are eye-visible. The stone also showed a strong red reaction to the Chelsea color filter, and chromium lines in the absorption spectrum. This stone can take its place as a collector's item along with other unusual cat's-eyes such as sillimanite, kyanite, petalite, kunzite, scapolite, and zircon, some of which have been illustrated in recent issues of *Gems & Gemology* and the *Journal of Gemmology*.
David Hargett

FIGURE CREDITS

The photos used in figures 1, 5, and 13 were taken by David Hargett. Bob Crowningshield is responsible for figure 2. Figure 3 was supplied by Clayton Welch. Figure 4 is © Harold & Erica Van Pelt. Robert Weldon was the photographer for figures 6, 7, and 8. Scott Briggs furnished figure 9. John Koivula took the photomicrograph in figure 10. Figure 11 is © Tino Hammid. Shane McClure took figure 12.