Gem Trade LAB NOTES

EDITOR
Chuck Fryer
GIA, Santa Monica

CONTRIBUTING EDITORS
Robert Crowningshield
Gem Trade Laboratory, New York
Karin N. Hurwit
Gem Trade Laboratory, Santa Monica
Robert E. Kane
Gem Trade Laboratory, Los Angeles

ALEXANDRITE, Cat's-Eye

Recently brought to the Santa Monica laboratory for identification was the fine 4.02-ct cat's-eye alexandrite illustrated in figure 1 as it appears when viewed with incandescent light. In addition to the very distinct change in color from red to blue-green (in natural or fluorescent light), the transparency of this stone was exceptional as a result of the high clarity; the majority of the fine needles causing the chatoyancy were concentrated in a layer at the base of the cabochon. Another interesting feature of this stone was the bluish appearance of the eye when viewed in fluorescent illumination.

Figure 1. Cat's-eye alexandrite as seen in incandescent light, 4.02 ct.

DIAMOND

Carved Diamond

Very flat diamond crystals are a real problem for diamond cutters, who frequently must sacrifice considerable weight to achieve anything approximating proper proportions in a faceted stone or else must make an unsatisfactory shallow stone, a "fish-eye." One innovative solution seen in the New York laboratory was a thin crystal that had been carved in the shape of a fish (figure 2). The natural surface characteristics of the crystal even resemble the scaly appearance of a fish. One would assume that in the case of this 2.87-ct stone, the weight retention was excellent.

Figure 2. Carved fish-shaped diamond. The stone weighs 2.87 ct and measures 18.38 mm × 8.95 mm × 2.26 mm thick.

Pink Diamonds

Some time ago in New York, we heard of an attractive pink diamond that lost its color when the stone was boiled in acid. Later it was determined that the stone had been "painted."

Recently, a round pink diamond weighing more than 3 ct (figure 3) was submitted to the New York laboratory for a full quality analysis. The stone showed strong blue fluorescence when exposed to long-wave ultraviolet radiation, so it was not surprising to see a distinct 4155 Å "cape" line with the hand spectroscope. When the stone was being graded for clarity, however, we realized that the color was in fact due to a coating—possibly an enamel. Using a technique developed years ago by Eunice Miles (whereby the stone is illuminated with both the fluorescent overhead light of the microscope and diffused transmitted light created by placing a white tissue over the light well underneath), some of the pavilion facets showed dark marginal lines paralleling the edges of the pavilion mains and a few "craters" where the coating was rejected, probably due to dirt. At 63× magnification (figure 4), the coating could be seen readily on the girdle. In all such cases, it is essential to examine the surface of the stone carefully to avoid overlooking the presence of a coating and inadvertently pronouncing the color natural.

Figure 5 shows a beautiful 3.31-ct "salmon" pink, heart-shaped diamond, brought into the New York lab, that the cutter says came off the wheel as intense a pink as he had ever seen. The owners were overjoyed when they saw the stone after it had been boiled out. When viewed

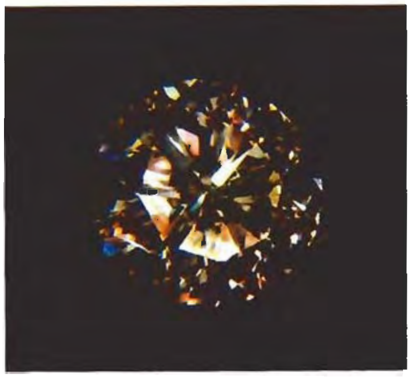

Figure 3. Pink diamond, 3 ct.

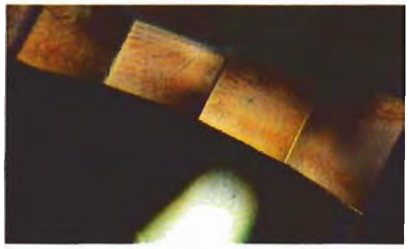

Figure 4. Pink coating on girdle of diamond shown in figure 3. Magnified 63×.

Figure 5. Pink heart-shaped diamond, 3.31 ct. Magnified 10×.

through the table toward the shoulders of the stone, totally reflected areas were actually red. Within a few days, however, the red had disappeared and in its place was a more common brownish pink. Boiled in acid, the stone temporarily regained some of its exciting red color, only to lose it again in a few days. Later, the stone was heated to a much higher temperature in an alcohol flame; the red again returned, but only temporarily.

We are told that this behavior is not unusual with yellow diamonds. Frequently stones appear intense yellow while hot from the wheel but assume a more normal color when finished and offered for sale. This is the first time such a color change in naturally colored pink stones has been reported to us.

We are reminded of another pink diamond, a magnificent 16-ct pear shape, which turned an ordinary brown following exposure to long- and short-wave ultraviolet and then X-radiation in rapid succession. Gentle warming in the light well of a Gemolite for a few minutes restored the pink color. A series of small rough pink diamond crystals were later exposed in the same manner. Fewer than half of the 16 specimens responded to the irradiation and warming in the same way. Clearly, all pink diamonds do not respond alike to irradiation and subsequent warming.

EMERALD

Imitation Emerald

Submitted to the Los Angeles laboratory for identification was the matched set of jewelry shown in figure 6, which consists of a necklace, a pair of earrings, and a combination ring and pendant. The client explained that when the combination ring and pendant was recently steam cleaned, the center stone lost a considerable amount of color. Subsequent testing showed that all of the green stones were untreated natural emeralds with the exception of the center stone in the combination ring and pendant, which proved to be a natural beryl that was coated with a green substance that imparted most of the color to the stone.

Examination of the treated stone under the microscope readily revealed a green coating in most of the surface fractures and cavities. The steam cleaning had apparently removed the green surface treatment from most of the stone, leaving small amounts only in these areas.

When the stone was tested with a cotton swab saturated with acetone, a very noticeable green stain appeared on the swab. Also, the green coating could be flaked off very easily with a sharp point such as the pin end of a brush probe. In addition, the coating melted when a thermal reaction tester was used.

This stone was treated in a manner very similar to that used on several stones seen recently in the laboratory and reported in the Summer 1982 issue of *Gems & Gemology*, pages 102 and 103. Indications are that the treatment on this stone is some type of paint (perhaps a transparent glass paint), although similar results have been obtained with green cement or plastic.

Tubules in Emerald

Recently encountered in the New York lab was a 1.57-ct flux-grown synthetic emerald that had all the properties of a flux-grown synthetic—low refractive index and birefringence, low specific gravity, and red fluorescence to ultraviolet radiation—but atypical inclusions (figure 7). A few spicules somewhat resembling those seen in hydrothermal synthetic emeralds, though without the crystal caps on the ends, were present, but some inclusions were darker and more tubular. By coincidence, we received for testing at the same time a high-property natural emerald which also had several long tubules (see figure 8) as well as numerous needles with random orientation seen near the girdle.

FLUORITE AND ROSE QUARTZ NECKLACE

The New York laboratory received a necklace that was reminiscent of

Figure 6. The large stone (11.68 mm × 8.90 mm × 6.50 mm) in the combination ring/pendant at the center of this suite is coated beryl; the other stones are natural emeralds.

the pink and green grossularite garnet strand pictured in the Summer 1982 issue of *Gems & Gemology*. However, testing proved this one to consist of round pale green fluorite beads alternating with rose quartz beads (figure 9). We were surprised that there was no damage or cleavage evident in the fluorite beads.

GARNET AND GLASS DOUBLETS

Figure 10 illustrates the first nonfaceted garnet-and-glass doublets seen in our New York lab. They are buff-topped, green, heart-shaped stones with garnet cabochon tops and green glass pavilions set with a natural red spinel and diamond in a pin to represent a "sham"-rock leaf. Buff top-cut stones have a cabochon crown and a faceted pavilion.

OPAL

Cat's-Eye Opal

Not too long ago, we examined in the New York laboratory a rough specimen of banded, translucent, brownish to green material that we tentatively identified as common opal, with no play of color. Later, we were allowed to examine and photograph a 1.5-ct chatoyant orange-brown cabochon (figure 11), said to have been cut from a clear band of this material. Testing by X-ray diffraction in the Santa Monica lab established the presence of cristobalite. A cristobalite diffraction pattern superimposed on an amorphous background indicates that the ma-

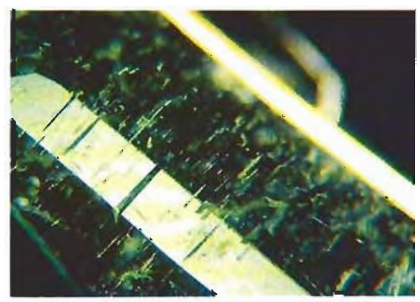

Figure 7. Tubules in a synthetic emerald. Magnified 30×.

Figure 8. Tubules in a natural emerald. Magnified 37×.

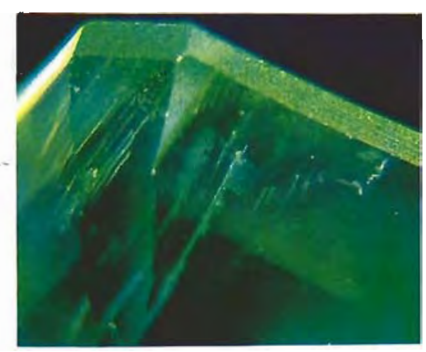

Figure 9. Fluorite and rose quartz necklace. The beads are approximately 8 mm in diameter.

Figure 10. Pin set with three buff-top garnet and glass doublets as well as a natural red spinel and a diamond. Magnified 10×.

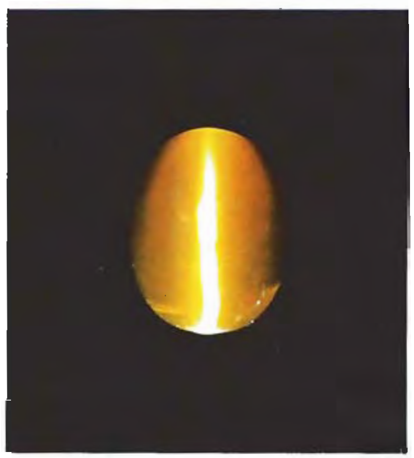

Figure 11. Cat's-eye opal, approximately 1.5 ct.

terial is opal. This is the first cat's-eye opal of this type seen by the lab.

Treated Opal

A section of oolitic opal is shown on page 104 of the Summer 1982 issue of *Gems & Gemology*. It is very similar in appearance to a dyed (sugar-treated?) oolitic opal seen recently in New York. Each of the round dots of the oolitic structure had absorbed the black dye, as had several fractures. Such stones must be examined very carefully before the color is pronounced natural.

PALEONTOLOGICAL GEMOLOGY

Aficionados of fossils will appreciate the perfection of the calcareous replacement of a trilobite, measuring approximately 32 mm × 38 mm, seen recently in the New York lab and shown here in figure 12. The fossil had been cleaned so carefully from its host rock that it could be definitely identified as the species *Phacops rana*. Mounted with care, it could be successfully worn in jewelry.

Other examples of the gemological use of fossilized organisms include amber, the multi-colored fossilized ammonites found principally in the Province of Alberta (Canada), petrified wood, and opal sometimes found replacing either animals or plants.

PEARLS

Cultured Button Pearls

A 3½-inch (9 cm) long, antique-appearing bar pin set with what seemed to be nine variously colored button pearls and two old-style-cut pear-shaped diamonds proved to the New York lab that appearances alone can be deceiving. The pearls, which resembled the American freshwater pearls seen in abundance 35 years ago, fluoresced to X-rays. The X-radiographs, too, suggested that most of the pearls were of natural origin; however, several showed centers that we associate with tissue-nucleated cultured pearls. Figure 13 shows one of each type.

Our client kindly volunteered to submit more than 100 half-drilled loose button pearls from which we were able to select buttons to match the colors of those on the bar pin (figure 14). X-rays of the loose pearls showed freshwater tissue-nucleated cultured origin. We have yet to learn by what process these symmetrical button pearls, with such flat unworked bases (as shown by the pearls on the left side of figure 14), could be cultivated.

Pearl Mysteries

A hank of more than 30 strands of small, variously colored, very baroque pearls came into the New York laboratory recently (see figure 15). They are unlike any we have ever seen here before. The darker-colored pearls fluoresced when exposed to long-wave ultraviolet radiation, suggesting natural color, saltwater origin. Whether the pearls are natural sac pearls or, as their irregularity suggests, some form of blister pearl, is not known to us. The possibility that they are the result of some type of cultivation exists. We would welcome information from our readers.

Some months ago, at the New York laboratory, we were asked to identify a number of white button pearls set in a platinum and diamond necklace. X-ray fluorescence indicated freshwater origin and the appearance and X-radiograph of the pearls indicated that they were natural. When the buttons were removed from their settings and X-rayed, however, the faint but characteristic central voids of tissue-nucleated freshwater cultured pearls appeared on the radiograph.

Figure 14. Loose freshwater tissue-nucleated cultured pearls arranged to show the various colors and the flat, unworked drilled bases.

Figure 15. A hank of small baroque pearls (largest is about 3 mm).

Figure 12. Fossilized trilobite, 32 × 38 mm, suitable for mounting in jewelery.

Figure 13. X-radiograph showing the structure associated with a natural pearl (left) and a tissue-nucleated cultured pearl (right).

This same group of button pearls, ranging up to 9.5 mm in diameter, is shown backside up in figure 16. Note that half of them have a peculiar, unnatural "balloon tire" or "doughnut" appearance in contrast to the flat backs of the drill-hole side of the multicolored small buttons shown in figure 14. This, of course, could not be seen in the mounted pearls. Why there is a difference, we do not know, since we do not know the method of cultivation of either type.

The fact that we have only recently been shown such symmetrical freshwater tissue-nucleated button shapes in quantity suggests that they are grown purposefully and are not, so to speak, accidental. On a short visit to pearl farms on Lake Biwa in Japan, the New York Lab

Figure 16. Drilled tissue-nucleated cultured button pearls viewed backside up.

Notes editor saw nothing that would indicate a process for producing such consistently well-shaped buttons. Possibly they are of Chinese or Tennessee River origin. Again, we would welcome information from knowledgeable readers.

QUARTZ, A Rare Cat's-Eye

A translucent, oval, brownish green cat's-eye cabochon set in a ring was received in the Santa Monica laboratory for identification and weight estimation. Figure 17 shows this attractive stone, which closely resembled a fine cat's-eye chrysoberyl. The refractive index, taken by the spot method, was 1.54 or 1.55 with weak birefringence. The optic figure could not be obtained because of the many parallel tube-like inclusions throughout the stone which caused the chatoyancy. There were no

Figure 17. Cat's-eye quartz ring, approximately 19 ct.

absorption lines visible in the spectroscope, thus eliminating the possibility of apatite. Nor did the stone show any reaction to ultraviolet radiation.

The indications were that the material was quartz. Using X-ray diffraction methods, we were able to prove conclusively that the material was indeed quartz. This was certainly one of the nicest quartz cat's-eyes this laboratory has ever encountered. The weight estimation formula suggested that the stone weighs approximately 19 ct.

RUBY AND SYNTHETIC RUBY ASSEMBLED STONE

Figure 18 shows the reflection from the cement joining the portions of a 2.5-ct, very thin, natural and synthetic ruby doublet submitted to our New York lab for identification. Had the separation plane been less obvious, the deception might have been more successful. Since most stones of this type consist of nonfluorescent Australian greenish to blue sapphire crowns cemented to strongly fluorescent synthetic ruby pavilions, exposure to ultraviolet radiation is usually a quick means of detection. The top and bottom of this stone fluoresced almost equally. Inclusions in the natural section could be seen easily and the stone might have been accepted as natural without question if examined carelessly.

SPINEL, with Color Change

The Santa Monica lab had the opportunity to examine a most unusual natural spinel. The 12.45-ct oval mixed cut displayed a change of color from dark blue in daylight to purplish blue in incandescent light (figure 19). The most remarkable characteristic was its absorption spectrum. In addition to the usual iron lines, there were absorption bands centered at 5400 Å, 5800 Å, and 6300 Å. These bands are generally present in the absorption spectrum

Figure 18. Reflection from the separation plane of a ruby and synthetic ruby assembled stone. Magnified 10×.

of a synthetic stone that owes its coloring to cobalt rather than iron.

UNCLASSIFIED ODDITIES

Back in the Summer 1971 issue of *Gems & Gemology*, we published a picture of an unusual broken cabochon that proved to be opal. We said then that "we have never seen anything even closely resembling this material." Several months ago, one of our Canadian readers with a long memory sent us an item she thought resembled the one in the photograph in that old back issue.

The item shown in figure 20, as received in Santa Monica, appeared

Figure 19. Color-change natural spinel, 12.45 ct, shown in incandescent light.

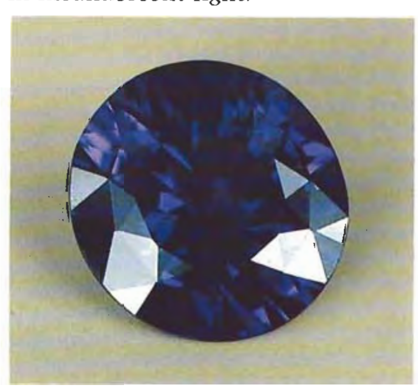

Figure 20. Broken concretion showing a bead-like core approximately 13 mm in diameter.

Figure 21. Striated structure of the surface of the bead-like core shown in figure 20. Magnified 63×.

to be a broken concretion of some sort measuring approximately 13 mm in diameter. The thin outer covering was light beige in color, with a rough texture to it. The concentric layers inward were translucent and light brown in color, and surrounded the semitransparent, nearly spherical, bead-like core. Figure 21, taken at 63×, shows the very finely striated structure of the surface of this inner bead.

A hot-point test, judiciously applied, evoked an odor of burning hair, indicating an organic origin. Our reader found the object in a can of tuna fish purchased as pet food. Although we know it is of organic origin, we have no idea what creature created it, or how it was formed. Those of us in the Santa Monica lab must confess, once again, that "we have never seen anything even closely resembling this material."

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Errata: *On page 230 of the Winter 1982 issue of* Gems & Gemology, *the absorption spectra for parisite and siderite were inadvertently reversed in printing. The spectrum in figure 8 is actually parisite; that shown in figure 9 is siderite.*

ACKNOWLEDGMENTS

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