

Gem Trade LAB NOTES

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ALEXANDRITE

A Large Cat's-Eye

The Santa Monica Gem Trade Laboratory had the opportunity to examine another fine cat's-eye alexandrite from Sri Lanka. The large (17 mm in diameter), round cabochon, which weighed 32.69 ct, had a pronounced change of color.

Figure 1 shows the stone as it appeared under incandescent (left) and fluorescent (right) illumination. For its large size, the stone was remarkably translucent. It showed few inclusions other than the long needles that caused the chatoyancy.

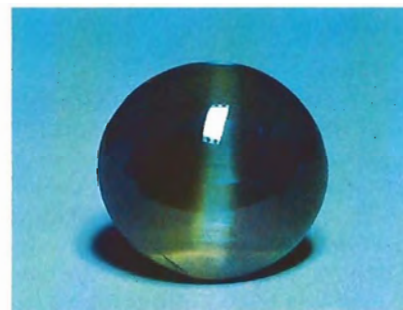


Figure 1. A cat's-eye alexandrite, 17 mm in diameter (32.69 ct) under incandescent light (left) and fluorescent light (right).

der magnification (figure 3). We do not know if this is an isolated piece

or if the material is destined for commercial use.

AMBER, in Plastic

A necklace of graduated barrel-shaped variegated yellow and brown beads (figure 2) came into the New York laboratory for identification. At first glance, it resembled the many amber necklaces we have tested over the years. However, this one proved different and new to us. The refractive index and fluorescence, which varied from spot to spot on the same bead, did not agree with amber, which would have only one R.I. and one color of fluorescence for the bead. The conclusion that the beads were actually composed of bits of amber embedded in plastic was confirmed by the acrid odor of the host material when tested with a hot point, as compared to the resinous odor of the embedded amber, and its appearance un-

Figure 2. A necklace of amber-in-plastic beads.



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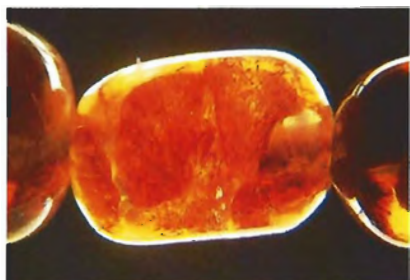


Figure 3. An amber-in-plastic bead at 10× magnification.

DIAMOND

Diamond Simulant

Our New York laboratory encountered what may be a new high in potential deception. Figure 4 is a photo of the culet area of a round brilliant-cut cubic zirconia, with a laser hole that reflects in several pavilion facets. At least one appraiser was fooled into thinking he was examining a diamond.

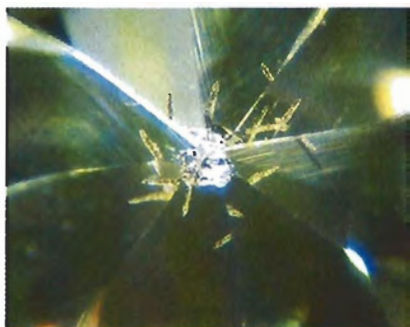


Figure 4. Faceted cubic zirconia that has been laser drilled. Magnified 60×.

Mysterious Wear on a Diamond Ring

Figure 5 shows a gold pavé diamond cluster ring submitted to the New York lab for identification of the stones. The client could not believe that diamonds could show so much wear. Not only did the center stone show obvious abrasions of the facet junctions (figure 6)—as severe as one would expect to see on zircon—but all of the smaller stones set completely around the band showed

equally severe abrasion. It is not known under what conditions the ring was subjected to such severe wear.

Painted Diamonds

When a New York diamond dealer decided to repolish a fancy orange marquise because of a myriad of odd scratches on the pavilion, he was hardly prepared for the result: The stone lost all orange color and proved to be faint yellow. It was obviously a case of a stone that had been "painted"—in this case, on the pavilion only.

This experience prompted his supplier to examine other fancy-colored diamonds in stock. Figure 7 shows an attractive yellow-green diamond that exhibited the same peculiar scratches, again only on the pavilion. When the stone was examined for irradiation stains on naturals, or for evidence of cyclotron treatment, nothing unusual was seen. However, the dealer decided to check to see if the stone was coated by attempting to break through the coating with a hard point. Figure 8 shows that his suspicions were correct; note the patchy area toward the narrow end of the facet where the coating was removed. Toward the girdle, the scratches in the coating are also visible. When the stone was cleaned carefully and the entire surface examined, one small "crater," or ring of color, was seen (as indicated by the arrow in figure 9). This was reminiscent of the craters in the coatings we used to see on near-colorless diamonds that had not been scrupulously cleaned before being coated with vitreous enamel to disguise the yellow. Because the color coatings we have seen recently also seem to be quite resistant, it is possible that they, too, are something like a vitreous enamel or a china glaze.

DIASPORE, A Rare Gem Material

Recently sent to the Los Angeles laboratory for identification was

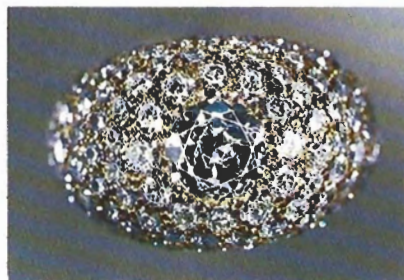


Figure 5. Pavé diamond ring in which the stones have been badly worn.

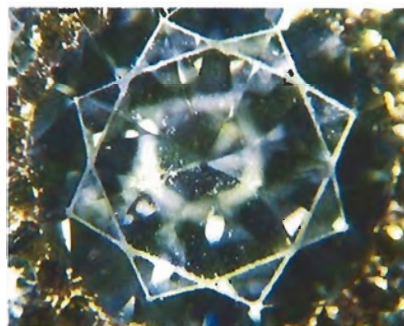


Figure 6. Abraded facet junctions on a diamond from the ring shown in figure 5. Magnified 23×.

the transparent, 1.24-ct, square step-cut gemstone illustrated in figure 10. This stone showed a moderate color change from light greenish yellow in daylight to light pinkish yellow in incandescent light.

Testing with a refractometer and a monochromatic filtered light source revealed that the stone was biaxial positive with a refractive index of 1.702 for alpha, 1.722 for beta, and 1.750 for gamma, with a corresponding birefringence of 0.048. Examination of the visible-light absorption spectrum revealed a weak band from approximately 4500 Å to 4600 Å. The specific gravity was determined by means of the hydrostatic technique to be 3.35 ± 0.03 . Strong pleochroic colors of yellowish green, brownish yellow, and violetish brown were observed. Microscopic examination revealed a partial cleavage, several needles

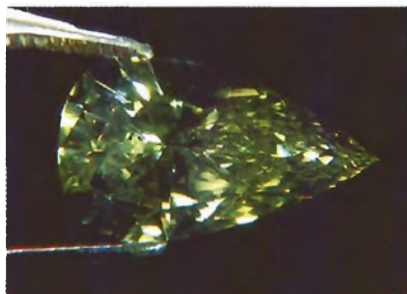


Figure 7. A 1.06-ct pear-shaped "painted" green diamond. Magnified 16 $\times$.

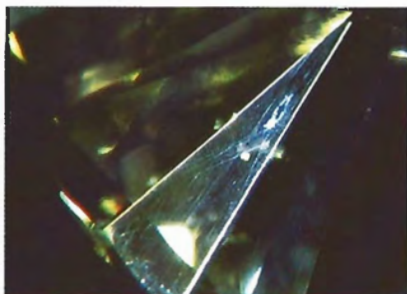


Figure 8. The patchy area the hard point made in the coating of the diamond shown in figure 7 proved it was "painted." The scratches also evident here provided an important clue to the unnatural source of the color.

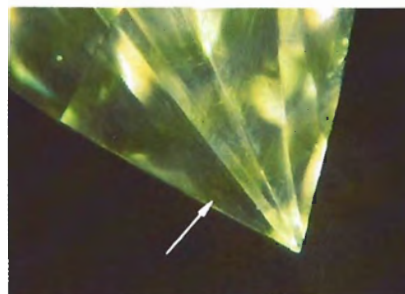


Figure 9. The ring of concentrated color at the point of the diamond illustrated in figures 7 and 8 is similar to "craters" seen in the past on near-colorless diamonds that had been coated with vitreous enamel to disguise the yellow. Magnified 63 $\times$.

and growth tubes, and a couple of included crystals.

The stone was then sent to our Santa Monica laboratory where a minute amount of powder was scraped from the girdle for X-ray diffraction. The results of the X-ray powder diffraction analysis confirmed that the stone was diaspore.

Diaspore is an aluminum hydroxide with the chemical formula



Figure 10. A 1.24-ct gem-quality diaspore.

$\text{AlO}(\text{OH})$. It is commonly found associated with corundum, possibly as an alteration product of the oxide. Diaspore occurs in numerous localities around the world, almost always as small crystals, with gemmy material being quite rare. Particularly notable, however, were crystals found at the emery mines in Chester, Massachusetts, which apparently were suitable for cutting. Gem-quality diaspore reportedly appeared very briefly on the market in Germany several years ago. The locality of the stone we examined is not known. Table 1 summarizes the properties of gem-quality diaspore.

EMERALD

Occasionally a stone will show patterns that provide proof of its

growth process. Figure 11 shows an elongated helix that is the manifestation of the spiral growth that occurs in a natural emerald. The length of the helix parallels the c-axis of the crystal.

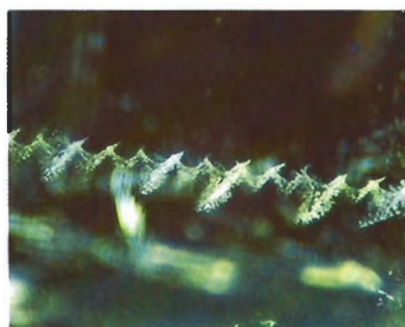


Figure 11. Spiral growth pattern in a natural emerald. Magnified 63 $\times$.

TABLE 1. Properties of gem-quality diaspore.

Dimorphous with boehmite	Optic character: biaxial positive
Formula: $\text{AlO}(\text{OH})$	Refractive indices: α 1.702, β 1.722, γ 1.750
Crystal system: orthorhombic	Birefringence: 0.048
Fracture: conchoidal	Pleochroism ^a : strong; yellowish green, brownish yellow, and violetish brown
Cleavage: perfect one direction	Fluorescence: weak yellow
Specific gravity: 3.3-3.5	Spectrum ^b : weak band at 4500 Å to 4600 Å
Hardness: 6½-7	

^aPleochroism for the stone tested; will vary depending on the color of the material.

^bOne sample only tested.

JADE Substitute

A white metal, closed-back ring that was bezel set with a translucent, mottled green and white, carved and pierced tablet was submitted to the Los Angeles laboratory for identification (figure 12). The client questioned whether the material was in fact jadeite or one of its substitutes.



Figure 12. A glass imitation of jadeite. The ring measures 29.4 × 21.4 mm.

Examination with the unaided eye revealed a somewhat swirled coloration, an overall vitreous luster, and several small conchoidal fractures. With the spot method, the refractive index was determined to be 1.57. Under magnification, the structure of the material was not that of a mineral, but rather was suggestive of glass or plastic. Using a fiber-optic illuminator for oblique illumination, we found the answer: several elongated gas bubbles were observed near the edge of the tablet. Testing with the thermal reaction tester provided no reaction, thus ruling out plastic as the identity of the material. It was then concluded

that this tablet was glass, a common substitute for jade.

LAPIS LAZULI, A New Imitation

The Santa Monica Gem Trade Laboratory was asked to identify the opaque blue cabochon pictured in figure 13. Examination of the cabochon surface revealed pyrite inclusions, easily visible with the unaided eye, some in the shape of well-defined octahedra. Magnification showed the presence, in some areas, of some elongated, rounded dark blue grains (figure 14). Therefore, it was possible that the material could very well be lapis lazuli.

However, further testing of the material did not verify our initial observation. Because of a poor polish, we obtained only a vague R.I. spot reading of 1.58. The specific gravity was determined by hydrostatic weighing to be 2.23. There was no reaction to ultraviolet radiation. All of these properties are different from those of lapis lazuli. A small amount of hydrochloric acid applied to the back of the cabochon caused slight effervescence; it also gave off an H_2S , or rotten egg, odor. A slightly discolored white spot remained on the surface that had been attacked by the acid.

The characteristic appearance of the material reminded us of the type of imitation lapis lazuli that is produced by P. Gilson. However, the refractive index and the specific gravity were slightly lower than have been reported for this type of imitation. When an X-ray diffraction analysis of the material was performed, the pattern obtained indicated that the material contained calcite and hauyne. A comparison of this diffraction pattern with that of Gilson's imitation lapis lazuli showed no correlation between the two materials. We concluded, therefore, that this imitation lapis lazuli was different from any we had encountered before.

OPAL, Update on Gilson Synthetic

The Santa Monica lab was shown three parcels containing numerous

Figure 13. This 4.09-ct cabochon represents a new lapis lazuli imitation.



8- × 10-mm cabochons that were labeled "blue opals." They were represented to be the latest synthetic black opals made by P. Gilson.

Our first impression was that these stones (figure 15) had a much more natural appearance than the synthetic material we had seen before. The play of color—predominantly green and blue but also with some red—was less distinct, so the stones had a much softer look than the earlier material, which showed very sharply defined color areas.

Under magnification, all of the cabochons examined showed numerous gas bubbles of various sizes. These bubbles were easier to see in the translucent material than in the more opaque stones. The reaction to ultraviolet radiation was diagnostic: a strong, chalky, yellowish green to short-wave and a faint to no reaction to long-wave. No phosphorescence was seen. All of the cabochons also showed the cellular snakeskin or "chicken wire" pattern that we have already found to be a distinctive characteristic of Gilson synthetic opals.

PEARLS, Cultured Button

We received a pretty, light pink, button-shaped pearl for identification. The pearl, which was undrilled, had a very high luster. It measured approximately 4 × 5 mm in diameter. At the center on the flat side we noticed a quite unusual

Figure 14. Note the pyrite and dark blue grains in the imitation lapis shown in figure 13. Magnified 22×.

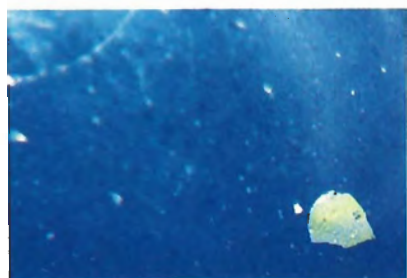


Figure 15. New Gilson synthetic opals (8 × 10 mm each).

structural characteristic. Figure 16 shows a pattern similar to that seen in the cross section of a tree trunk.

The pearl showed no fluorescence to X-radiation. However, the X-radiograph revealed a fairly small, round, mother-of-pearl bead center, proving that the pearl was cultured rather than natural.

PINITE, A Massive Form of Muscovite

Recently sent to the Los Angeles laboratory was an opaque, mottled, dark brown, light brown, and white carving that had a floral motif on one side and was inscribed with Oriental characters on the base and the other side (see figure 17). Examination with the unaided eye revealed an overall dull, waxy luster. A broken portion near the top of the carving showed a dull, waxy, granular fracture.

Given the relatively poor polish, a refractive index reading was difficult to obtain; using the spot method, however, we found an approximate value of 1.57. To determine the approximate specific gravity of the material, we gently immersed the carving in bromoform (which has a density of 2.89). The carving ascended at a moderate rate; a specific gravity near 2.7 was estimated. A hardness test was carefully performed on a partially con-

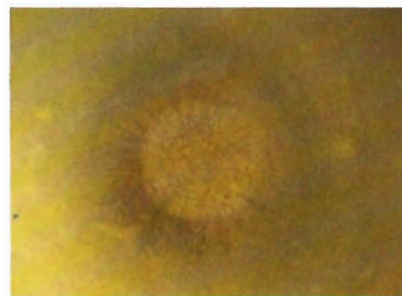


Figure 16. Unusual growth mark on a cultured button pearl. Magnified 30×.

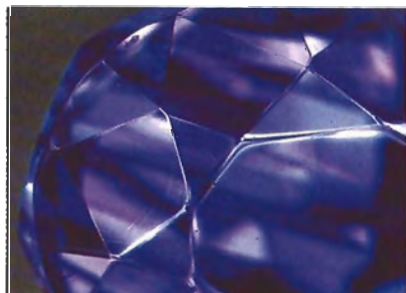
cealed, recessed fractured area; on the basis of the results, the stone's hardness was estimated to be around 3 on the Mohs scale.

Because we were able to perform very few routine gemological tests on this carving, a minute amount of powder was scraped from it for X-ray diffraction analysis. The results of the X-ray powder diffraction showed that it matched one of the patterns of muscovite mica. The carving was identified as pinite, a massive form of muscovite. Pinite is a general term used to describe a number of alteration products, which include muscovite. Pinite is essentially a hydrous silicate of aluminum and potassium, corresponding closely to muscovite in composition, and is generally regarded as its massive variety. It is usually impure from the admixture of clay and other substances.



Figure 17. This carving made from pinitite, a massive form of muscovite, measures 53.2 × 20.9 mm.

Figure 18. Rounded facet junctions on a faceted tanzanite. Magnified 30×.



ZOISITE (TANZANITE), Rounded Facet Junctions

Recently submitted to the Los Angeles laboratory for identification was the 2.93-ct bluish purple oval mixed cut illustrated in figure 18. With subsequent testing the stone was identified as zoisite, known in the trade as "tanzanite." The somewhat unusual feature of the stone was the presence of very rounded facet junctions (again, see figure 18).

Rounded facet junctions are typ-

ical of, and usually associated with, molded stones, such as glass or plastic. Such facet junctions are often observed in these less expensive imitations; they are formed by pressure as the molten material is molded to appear as if faceted (the more expensive glass imitations are often faceted after molding).

Molded faceted junctions are not nearly as sharp as the facet junctions on most materials that have been cut and polished. This tanzanite, however, exemplifies the fact that a faceted gemstone, like its molded imitation, may have rounded facet junctions.

The presence of rounded facet junctions in faceted materials is often a result of poor polishing techniques. If excess pressure is applied to polishing laps that are soft and flexible, too much polishing powder can build up near facet junctions between the surface of the stone and the lap, thus rounding the facet edges. This characteristic may also occur with stones that are fairly soft, such as fluorite, particularly if wax, pitch, or wood laps are used for polishing. Tanzanite is usually polished on a hard tin lap with aluminum oxide; sharp facet junctions may be obtained easily even though the hardness of zoisite is only 6–7.

Rounded facet junctions may also occur when a stone is repolished with a polishing buff. This sometimes happens when a jeweler polishes a mounting, after repringing or sizing, without removing the stone.

ACKNOWLEDGMENTS

The photos in figures 1, 13, and 15 were taken by Mike Havstad. Andrew Quinlan, from the New York laboratory, took figures 2–9 and 11. John Koivula supplied figure 16. Shane McClure, from the Los Angeles laboratory, furnished figures 10, 12, and 17. Figure 14 was taken by Chuck Fryer. Figure 18 was furnished by Tino Hammid.

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