Gem Trade LAB NOTES

EDITOR
C. W. Fryer
GIA, Santa Monica

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

AMETHYST with Brazil Twinning Visible without Polarized Light

To our surprise, a beautiful, nearly flawless, free-form natural amethyst submitted to the New York laboratory showed evidence of Brazil twinning when immersed, even in unpolarized transmitted light (figure 1). When viewed along the same direction (parallel to the optic axis) in polarized light, it displayed the spectacular twinning evident in figure 2. RC

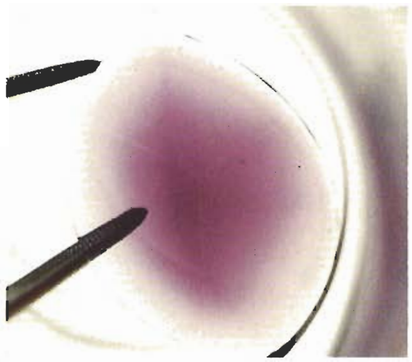


Figure 1. Twinning was evident in this natural amethyst (immersed) even with unpolarized transmitted light.

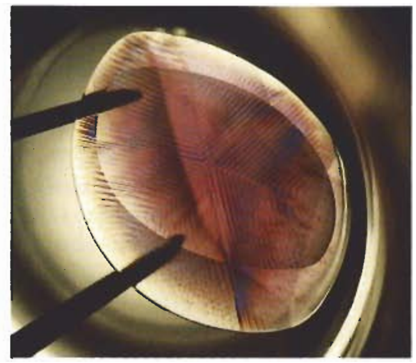


Figure 2. With polarized light, the twinning in the stone shown in figure 1 is spectacular.

Synthetic AMETHYST with Inclusions Typical of Hydrothermal Origin

Although synthetic amethyst is grown hydrothermally, we have not previously seen inclusions that are characteristic of the same hydrothermal process used to grow synthetic emeralds such as Biron and Regency. In New York, however, we recently encountered a stone with a wedge-shaped two-phase inclusion attached to a low-relief quartz crystal (figure 3) that closely resembles the inclusion in a Biron synthetic emerald pictured on page 164 (figure 11) of the Fall 1985 issue of *Gems & Gemology*. Nailhead spicules similar to those that are typical of hydrothermal synthetic emeralds have been reported in synthetic amethysts. However, the closest to such inclusions we have encountered to date are the somewhat acicular crystals shown in figure 4. RC

Figure 3. This spicule with quartz crystal cap seen in a synthetic amethyst closely resembles an inclusion seen in the hydrothermally grown Biron synthetic emerald, which appears on page 164 of the Fall 1985 issue of Gems & Gemology. *Magnified 45×.*

Figure 4. These spicules are the closest counterparts to the nailhead spicules typical of hydrothermal synthetic emerald that the lab has seen thus far in a synthetic amethyst. Magnified 20×.

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

ANDALUSITE with Growth Bands

Among a group of valuable study stones recently donated to GIA in New York by a local dealer is a 20-ct emerald-cut andalusite that shows distinct curved growth, or color, bands (figure 5). Curved growth bands are usually a sure sign that the stone is a synthetic. However, andalusite is not, to the best of our knowledge, produced synthetically. In addition, there were numerous unquestionably natural inclusions in this stone to prove its natural origin. *RC*

Figure 6. *This 1.72-ct rough crystal and 0.39-ct faceted stone are fine examples of gem-quality clinohumite.*

Faceted CLINOHUMITE

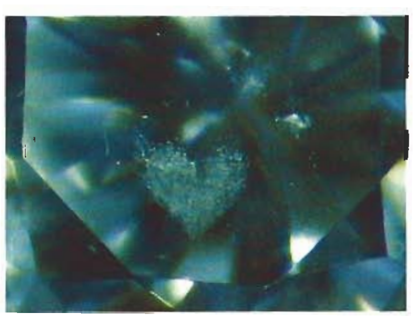
Recently donated to GIA in Santa Monica was a 0.39-ct cut stone and a 1.72-ct rough crystal of the mineral clinohumite (figure 6). The refractive indices were determined to be α = 1.631, β = 1.642, and γ = 1.668, thus indicating the biaxial positive nature of the material. The specific gravity was approximately 3.18. No absorption spectrum was visible with the hand spectroscope. Although there was no reaction to long-wave ultraviolet radiation, both pieces fluoresced a moderate to strong chalky orangy yellow to short-wave U V radiation. X-ray powder diffraction provided a pattern that matched ASTM pattern no. 14-7 for clinohumite. Although a few examples of faceted clinohumite have been recently identified by our Los Angeles laboratory, cut stones of this material are still considered rare. *CF*

Saint Valentine's DIAMOND

What a unique Valentine's Day gift for the inclusion enthusiast! The photo shown in figure 7 was sent to us by Mr. A. De Goutière of Victoria, B.C. It shows a distinctive cloud-like inclusion that proves conclusively that this is a diamond with a heart. Although we have seen a great number of fancifully shaped inclusions, this is the first heart-shaped one that has ever come to our attention. *CF*

Figure 5. Curved color bands are seen here in natural andalusite. Magnified 20×.

Figure 7. Note the heart-shaped cloud in this 0.015-ct brilliant-cut diamond. Magnified 12×.



Imitation EMERALD: Synthetic Spinel-and-Glass Triplets

In the early part of this century, imitation emeralds were constructed by attaching a colorless quartz crown to a colorless quartz pavilion with a green cement. These quartz triplets were called soudé emeralds after the French term *émeraude soudée* (soldered emerald). A more recent type of quartz triplet is thought to have been introduced into the market in the early 1920s. These assembled stones

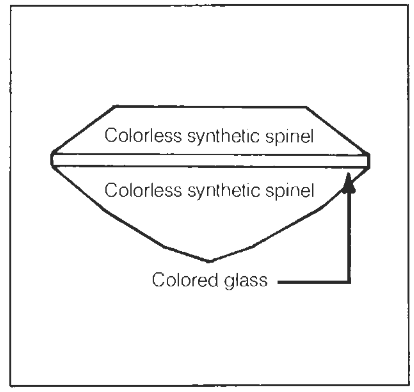


Figure 8. This 11.66-ct imitation emerald and the other variously colored stones are synthetic spinel triplets that use sintered colored glass instead of cement. The drawing shows the construction of these triplets.

are similar to the earlier type with the exception that the unstable cement was replaced by what is believed to have been a layer of colored sintered lead glass.

Recently submitted for identification to the Los Angeles laboratory was a similar type of imitation emerald, but one that we seldom have the opportunity to examine. This type of assembled stone was first produced in 1951 by Jos Roland of Sannois, France, and uses colorless synthetic spinel instead of quartz for the crown and pavilion. Known as *soudé sur spinelles*, these synthetic spinel triplets were produced in various colors by sintering the desired color of glass to the colorless crown and pavilion (see figure 8). The assembled stone that we recently tested was an 11.66-ct green emerald cut.

When examined with a polariscope, this stone exhibited a moderate "cross-hatched" appearance and snake-like bands (caused by anomalous double refraction), both of which are typical of synthetic spinel. When the table of this stone was tested with a refractometer in conjunction with monochromatic light equivalent to a sodium vapor lamp, a multiple reading was observed (figure 9): a strong reading at 1.724 (the synthetic spinel) and a weaker one at 1.682 (the center glass layer). A few other shaded areas between these two were also observed. The yellowish green glass layer was 0.5 mm thick; we obtained a refractive index of approximately 1.682 when we directly tested this area.

Using hardness points, we estimated the hardness of the glass layer to be around 4 on the Mohs scale, which is consistent with the hardness of many high-refractive-index lead glasses. When the stone was examined with a GEM spectroscope unit, no bands or lines were observed.

When the stone was examined with a microscope, faint evidence of a separation plane was seen in the form of small flattened, rounded, and irregularly shaped gas bubbles that were most visible when fiber-optic illumination was used. When we looked at the stone perpendicular to the girdle, in either dark-field or fiber-optic illumination, the thick glass layer was obvious because of its rounded edges and very strong irregular swirl marks. The yellowish green color of the glass layer and the colorless nature of the crown and pavilion were readily revealed when the stone was immersed in methylene iodide and viewed in a direction parallel to the girdle plane.

This stone exhibited an interesting reaction to long-wave ultraviolet radiation. When viewed nearly perpendicular to the girdle with the stone's table closest to the radiation source, the crown showed a strong chalky yellow-white fluorescence, the glass layer was inert, and the pavilion showed a strong pure yellow

Figure 9. Multiple refractive index readings of synthetic spinel and the fused glass center.

(not chalky) fluorescence. However, when the culet was positioned nearest to the light source, an opposite reaction was observed: The pavilion now showed a strong chalky yellow-white fluorescence, the glass was still inert, and the crown exhibited a strong pure yellow (see figure 10). This interesting phenomenon is probably caused by the glass layer restricting the amount of long-wave ultraviolet radiation that reaches the portion of the stone that is not directly facing the radiation source. When exposed to short-wave ultraviolet radiation, the assemblage was

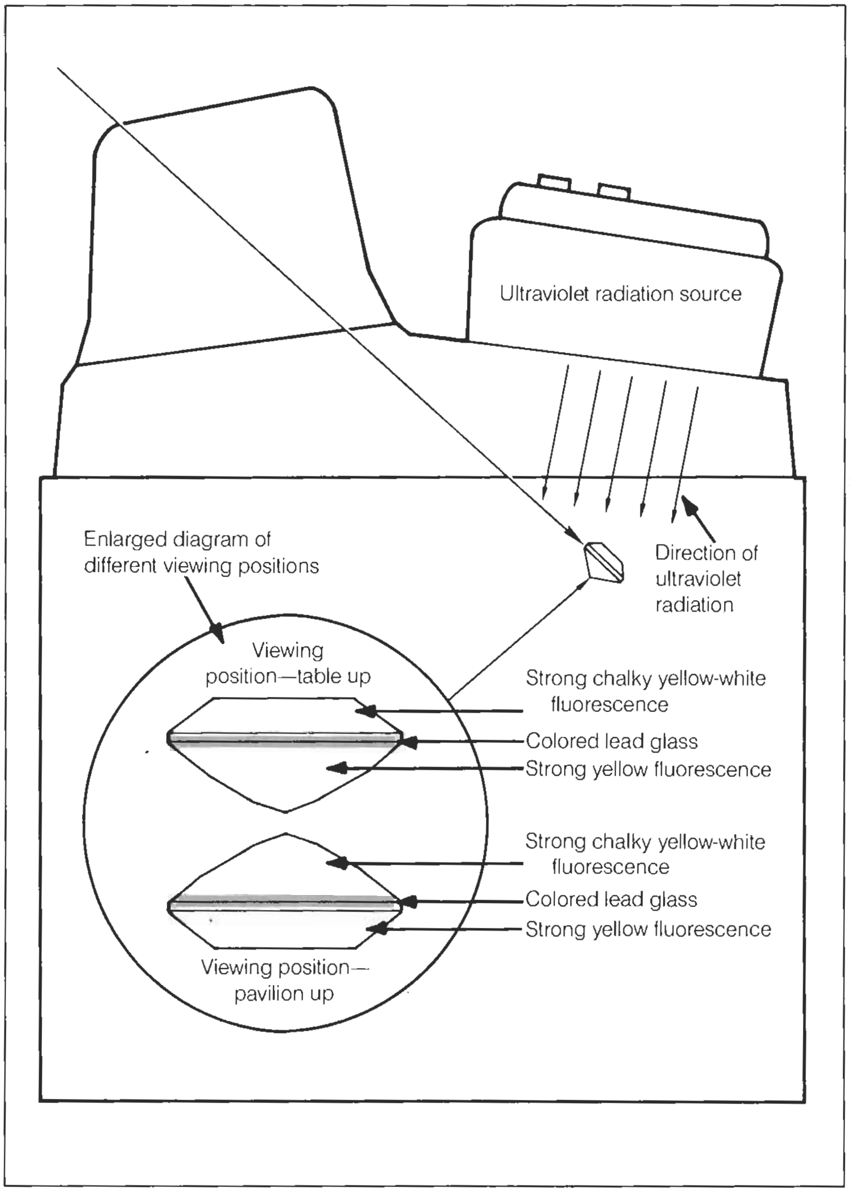


Figure 10. This drawing shows how the reaction to long-wave ultraviolet radiation of a synthetic spinel triplet differs depending on the proximity of different sections of the stone to the radiation source.

observed to be nearly inert. When the stone was exposed to X-rays, an extremely weak, barely perceptible, chalky green fluorescence was seen and there was no phosphorescence. *RK*

Synthetic EMERALD with a "Breadcrumb" Inclusion

We had occasion in New York to test a hydrothermal synthetic emerald of unknown manufacture that weighs approximately 9 ct. A large white "breadcrumb" inclusion, similar in appearance to those seen in synthetic amethyst, was easily visible at 10× magnification (even though figure 11 was taken at 45×). We have not previously described this type of inclusion in a synthetic emerald. *David Hargett*

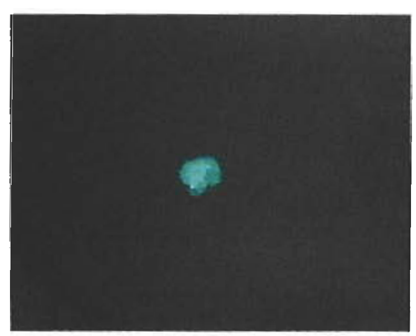
Imitation LAPIS LAZULI

Figure 12 shows a strand of attractive 8-mm blue beads that resemble lapis lazuli and were sold as dyed howlite. We had never before seen dyed howlite in any color other than a turquoise blue. The polished half in figure 13 shows the depth of dye penetration. From tests performed on this bead, we determined the specific gravity to be 2.85, and the birefringence of approximately 0.18 to be derived from the refractive indices of 1.50 and 1.68. These properties match those of dolomite, not howlite. *RC*

Eroded Natural PEARLS

The New York laboratory recently examined the button-shaped natural pearl (12.6 × 12.8 × 10.1 mm) with a threaded metal insert that is shown in figure 14. The pattern around the insert matches that of the pearl cup (figure 15). Evidently, over the years, skin acids have eroded the areas near, but not protected by, the cup—a sort of slow-action stencil. We have previously reported a similar situation (*Gems & Gemology*, Summer 1986, p. 235) with a large cultured pearl on a conventional pearl cup. In the Winter 1983 issue of *Gems & Gemology*, another eroded pearl was pictured on page 235; in this case, however, the erosion was extremely bad and took

Figure 11. A "breadcrumb" inclusion such as this is not usually seen in synthetic emerald. Magnified 45×.



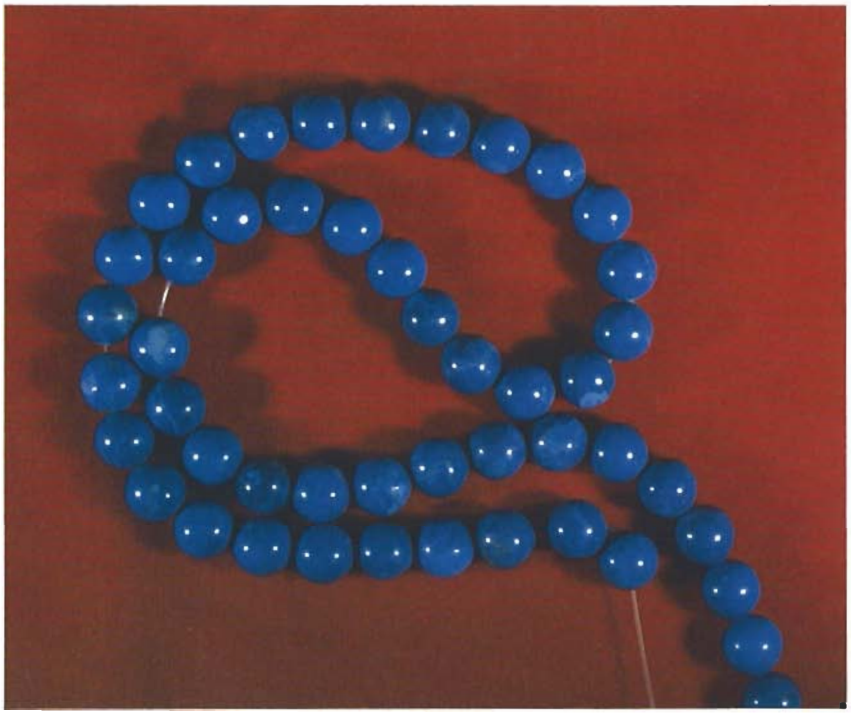


Figure 12. These 8-mm beads of dyed dolomite were originally represented to be a dyed howlite imitation of lapis lazuli.

Figure 13. Note the shallow penetration of dye in this polished half of one of the dyed dolomite beads shown in figure 12. Magnified 15×.

Figure 14. The base of this natural pearl has been eroded, probably by skin acid. The button-shaped pearl measures 12.6 × 12.8 × 10.1 mm.

Figure 15. This metal banding undoubtedly acted like a stencil to produce the erosion pattern seen on the pearl in figure 14. Magnified 10×.

place beneath the eight prongs, rather than beside them. RC

Imitation PEARLS, "Coque de Perle"

In recent weeks, the Los Angeles laboratory was asked to identify a material that is frequently offered for sale as "Mabe pearl," or sometimes as "Nautilus pearl." Figure 16 shows the front and back views of what resemble blister pearls that have been mounted as earrings. The lustrous gray oval hemi-cylindrical bead is cemented to a mother-of-pearl base. With magnification, we observed parallel transverse ridges, which do not occur in true blister pearls that have been formed by any of the various pearl-producing mollusks. This particular structure resembles in appearance the growth pattern of the chambered nautilus, and these attractive "blisters" have actually been cut from the central pearly whorl of the nautilus shell. These sections are more commonly known in the trade as "Coque de perle" (which translates approximately to "Shell of the pearl"). KH

Cat's-eye PETALITE

Several translucent to opaque, weakly chatoyant pink cabochons reported to be cat's-eye analcime from South Africa were donated to GIA during the ICA (International Colored Stone Association) Congress in Idar-Oberstein last year. One of these cabochons is illustrated in figure 17. The mineral analcime (an-

Figure 16. These 15.0 × 12.5 × 9.0 mm "Coques de perle" are imitation pearls that were worked from a Nautilus shell.

alcite), which forms in the cubic system, is a hydrous sodium aluminum silicate with the formula $NaAlSi_2O_6 \cdot H_2O$. For this material, Webster reports a refractive index of 1.487, a specific gravity of 2.22 to 2.29, and a hardness around 5 to 5½. Analcime, a member of the zeolite group, is generally known to gemologists as a rare, small, colorless faceted collector's stone.

The 20.3-ct pink cabochon we examined showed a spot refractive index reading of 1.51, a specific gravity of approximately 2.34, and (on the basis of hardness points used on the back of the stone) a hardness of approximately 6½. Exposure to short-wave ultraviolet radiation revealed a weak dull red fluorescence, and exposure to long-wave U V radiation revealed an extremely weak dull red fluorescence with several "veins" of moderate to strong chalky white fluorescence. Testing with a polariscope showed an aggregate reaction. No bands or lines were observed when the stone was examined with a hand spectroscope. On the basis of these properties, the chatoyant pink cabochon was identified as petalite. Petalite is a lithium aluminum silicate with the formula $LiAlSi_4O_{10}$; it has been reported to occasionally show chatoyancy. X-ray powder diffraction analysis on a similar cabochon showed a pattern that matched the standard ASTM pattern for petalite. *RK*

Figure 17. This 20.3-ct pink petalite, which shows weak chatoyancy, was originally represented as analcime.

Figure 18. These unusual 8.5-mm beads proved to be pyrite in quartz.

PYRITE in Quartz

The New York Gem Trade Laboratory recently examined the necklace of dark beads shown in figure 18. Although the beads are not spectacular in appearance when worn, they are fascinating when viewed with the microscope. They consist of a myriad of randomly oriented pyrite crystals in a transparent to translucent near-colorless quartz matrix. Where the pyrite has been exposed on the surface by polishing, the bright metallic flashes provide an interesting effect (figure 19). The continuing popularity of bead necklaces encourages the use of unusual new materials. *RC*

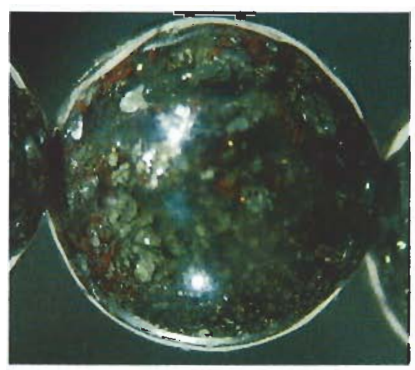


Figure 19. The quartz beads shown in figure 18 appear dark because of the heavy concentration of pyrite inclusions. Magnified 15×.

FIGURE CREDITS

Dave Hargett took the photos in figures 3 and 4, 11-13, and 18-19. Clayton Welch is responsible for figures 1, 2, 5, 14, and 15. Mr. A. De Goutière kindly supplied figure 7. Figures 8, 9, 16, and 17 are the work of Shane McClure. Figure 6 is © Tino Hammid. The drawings in figures 8 and 10 were prepared by Joni Takeshita.