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COLORED STONES AND ORGANIC MATERIALS

Jadeite bangle with the appearance of polymer treatment. Jadeite jade always comes under close scrutiny in the market because it is so frequently treated. The treatment options for jadeite jade are numerous: bleaching, dyeing, polymer impregnation, or a combination of these. Polymer impregnation is a particular favorite, a process that is not always easy to observe by magnification. A 244.29 ct translucent light to deep green and brownish yellow bangle measuring approximately 70 × 14 mm was recently submitted to the Lai Tai-An Gem Lab in Taipei. The client was concerned about a more transparent light-colored area (figure 1) that appeared to be possible evidence of impregnation.

Standard gemological testing indicated a spot RI reading of 1.54 at the more transparent light-colored area and 1.66 elsewhere on the bangle, an SG of approximately 3.32, and a characteristic jadeite spectrum exhibiting a band at about 437 nm. FTIR and Raman spectroscopy were also applied, producing spectral features that confirmed the bangle's identity as jadeite jade. Microscopic examination revealed natural inclusions within the transparent area that appeared to be polycrystalline (figure 2). Neither would be seen in an impregnated specimen, ruling out this treatment. Further analysis with Raman microscopy was conducted to identify its true nature.

Figure 1. This 244.29 ct translucent light to deep green and brownish yellow bangle measures approximately 70 × 14 mm. It contained a transparent, light-colored area that suggested the possibility of a polymer impregnation process. Photo courtesy of Lai Tai-An Gem Lab.

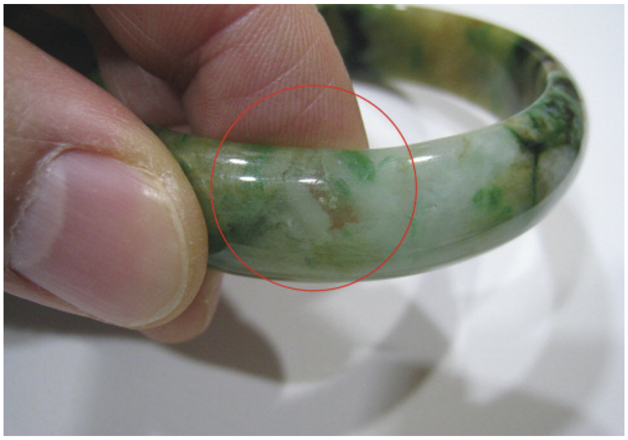

Figure 2. Microscopic examination of the suspect area revealed natural inclusions and a crystalline form. Neither would be found in an impregnated specimen. Photo courtesy of Lai Tai-An Gem Lab.

Sharp absorption peaks at around 207, 347, 400, 465, and 990 cm^{-1} were a match for nepheline (figure 3), a min-

Editors' note: Interested contributors should send information and illustrations to Justin Hunter at justin.hunter@gia.edu or GIA, The Robert Mouawad Campus, 5345 Armada Drive, Carlsbad, CA 92008.

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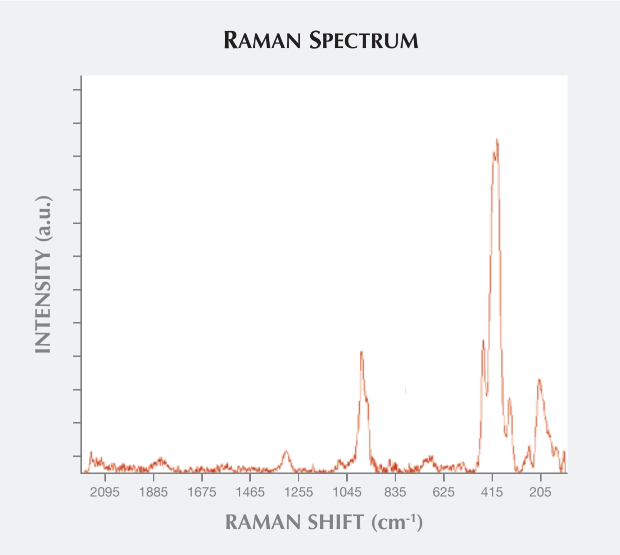

Figure 3. Sharp absorption peaks around 207, 347, 400, 465, and 990 cm^{-1} were consistent with nepheline, a mineral sometimes associated with albite in jadeite.

eral sometimes associated with albite in jadeite. The nepheline crystal remained intact during the fashioning process, and its presence led to confusion over whether the bangle had been treated.

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Prasiolite with inclusion influenced by Brazil-law twinning. The Indian Gemological Institute Gem Testing Laboratory recently examined a 6.43 ct transparent grayish yellowish green oval mixed-cut specimen. Standard gemological examination gave an RI of 1.545–1.553 with a uniaxial positive optic sign and a birefringence of 0.008, and a hydrostatic SG of 2.65. These readings readily identified the stone as prasiolite, a green variety of quartz.

The prasiolite displayed prominent Brazil-law twinning, with very sharp twinning planes when the sample was observed parallel to the optic axis between crossed polarizing filters, though only two sections of twinning were clearly visible in the stone (figure 4). The presence of such sharp and prominent Brazil-law twinning confirmed the sample's natural origin. When synthetics do exhibit such patterns, it has a flame-like or irregular shape (J.I. Koivula and E. Fritsch, "The growth of Brazil-twinned synthetic quartz and the potential for synthetic amethyst twinned on the Brazil law," Fall 1989 *G&G*, pp. 159–164).

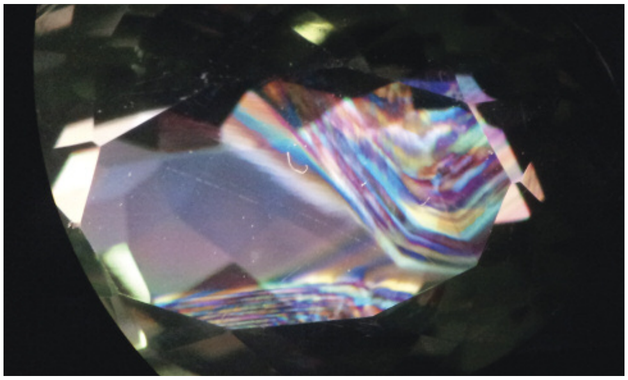

Figure 4. Between crossed polarizers, the prasiolite showed two sections of Brazil-law twinning in the optic-axis direction. Photo by Meenakshi Chauhan, magnified 15×.

Magnification showed no inclusions, but illumination from the side using a fiber-optic light source revealed minute white particles that scattered the light (figure 5). These pinpoint inclusions followed the pattern of the Brazil-law twinning, which was apparent without the aid of polarized filters (E.J. Gübelin and J.I. Koivula, *Photoatlas of Inclusions in Gemstones Volume 2*, Opinio Verlag, Basel, Switzerland, 2005, p. 573).

Minor rhombohedron faces that did not feature Brazil-law twinning were filled with these minute light-scattering particles. These inclusions were visible on the faces with some tilting of the fiber-optic light source but did not show any pattern (figure 6). The minute particles were not visible in both zones simultaneously.

In diffused transmitted light, the minor rhombohedron faces displayed a slightly darker shade of the grayish yellowish green color seen in prasiolite. These faces also showed a wavy internal growth structure between crossed polarizers. The major rhombohedron faces were even lighter in color. No color bands were observed in the stone.

Although the owner claimed the stone's color was natural, the presence of Brazil-law twinning raised suspicion, since this twinning has only been associated with the

Figure 5. Fine dotted inclusions demonstrated a Brazil-law twinning pattern along the optic axis, exactly where this twinning was visible under polarized filters. Photo by Meenakshi Chauhan, magnified 10×.

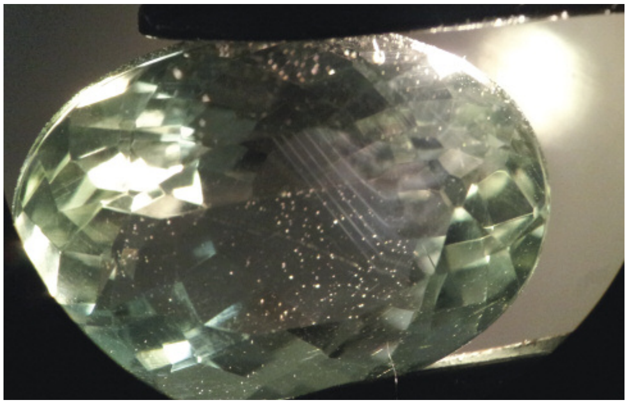

Figure 6. Fine dotted inclusions were visible in this minor rhombohedral face where Brazil-law twinning was absent. Photo by Meenakshi Chauhan, magnified 10×.

amethyst variety of quartz. There is still no way to separate naturally heated from heat-treated prasiolite.

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Record-size natural moissanite crystals discovered in Israel. Synthetic silicon carbide (SiC) is well known in the gem and jewelry market as synthetic moissanite. Natural SiC is very rare and has been found as tiny crystals (usually less than 1.5 mm) in only a few deposits worldwide (Y. Bauer et al., "Moissanite from middle mountains of Czechoslovakia," *International Geology Review*, Vol. 7, No. 7, 1965, pp. 1194–1206; A.A. Shiryaevet et al., "Moissanite (SiC) from kimberlites: Polytypes, trace elements, inclusions and speculations on origin," *Lithos*, Vol. 122, No. 3-4, 2011, pp. 152–164, and references therein).

Over the past 14 years, however, more than 2,500 crystals of natural moissanite have been discovered by Shefa Yamim, an Israeli exploration and mining company. The crystals come from primary and alluvial deposits along the Kishon River, near Haifa in northern Israel. Shefa Yamim began prospecting in this area following the 1988 prophetic statement of the Lubavitcher Rebbe that "precious stones and gems" would be discovered in the valley next to Haifa (see video at http://youtu.be/_uzY5mV8rdY). In 2000, the company unearthed moissanite crystals ranging from 0.1 to 1 mm in size; two years later, 2.2 mm crystals were found. In 2009, a 3.5 mm moissanite discovery set a world record, only to be surpassed in August 2012 by a crystal measuring 4.1 mm—the largest specimen to date (figure 7 and http://goo.gl/JZFiwe).

There is evidence of even larger crystals, as many broken crystals were discovered. Some crystals have also been found *in situ* in the volcanic rock of the Rakefet magmatic complex, one of the magmatic bodies of Mount Carmel, just southeast of Haifa, which is drained by a small tributary to the Kishon River.

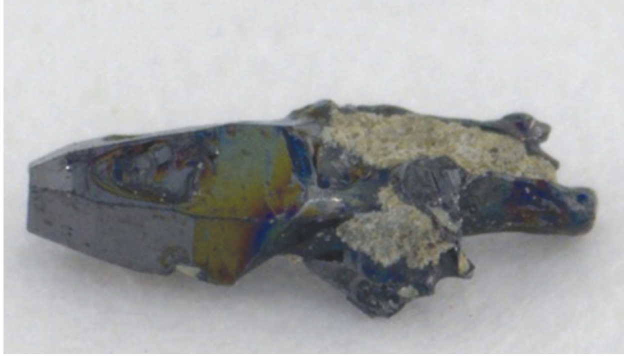

Figure 7. The largest known natural moissanite crystal, found along the Kishon River in northeastern Israel, measures 4.1 mm in its longest dimension. Photo by Vered Toledo.

We studied 30 Israeli crystals ranging from less than 1 mm to 3.5 mm. All were identified as moissanite (SiC 6H) by Raman spectroscopy. Their morphology was hexagonal,

Figure 8. These natural moissanite crystals are hexagonal to pyramidal, showing rounded areas that may result from either growth or dissolution. The crystals range up to 2.5 mm (not to scale). Composite photo by Aurélien Delaunay.

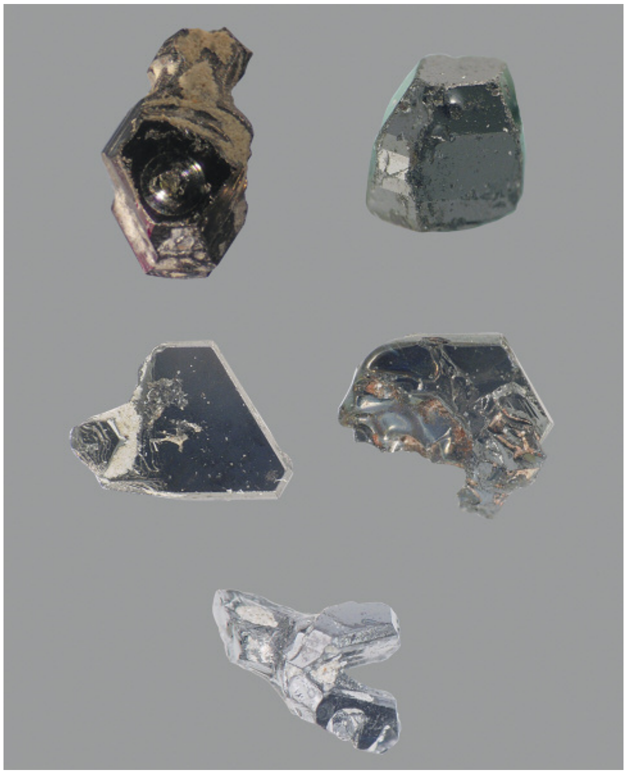

Figure 9. The colors seen in moissanite from the Mount Carmel area of northern Israel range from dark blue to light green. Note the broken or rounded morphology. Composite photo by Aurélien Delaunay.

bipyramidal to platy, with the pinacoid generally present (figures 8 and 9). The crystals were often broken, particularly the larger ones with rounded, shiny surfaces (again, see figure 7). As shown in figure 9, the crystals were transparent and ranged from deep blue (the most common color) to light green. Except for size, these characteristics are similar to those of other natural moissanites documented in the literature. The crystals are often associated with small bits of creamy white or red complex matrix.

The crystals we examined were inert under long- and short-wave UV radiation, with the exception of five small green to light green samples. In these five specimens, medium to strong orange luminescence was seen under either long- or short-wave UV. These were found to be magnetic when placed next to a powerful permanent alnico magnet. All of the samples contained small metallic inclusions, the largest approximately 30 microns in size, which could be the source of magnetism. We will continue to follow moissanite exploration in this area, and a more in-depth research paper is forthcoming.

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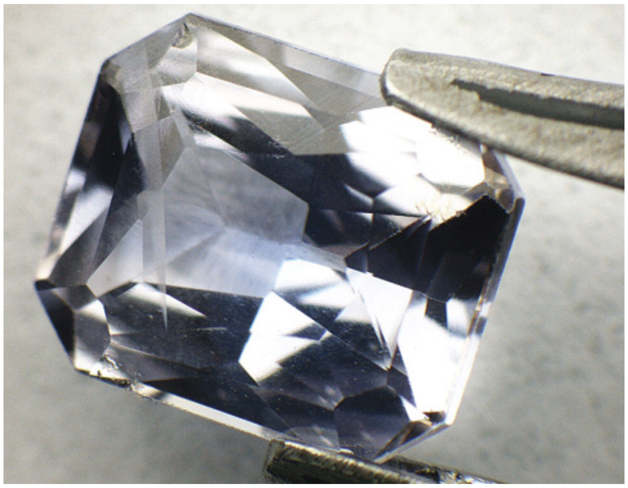
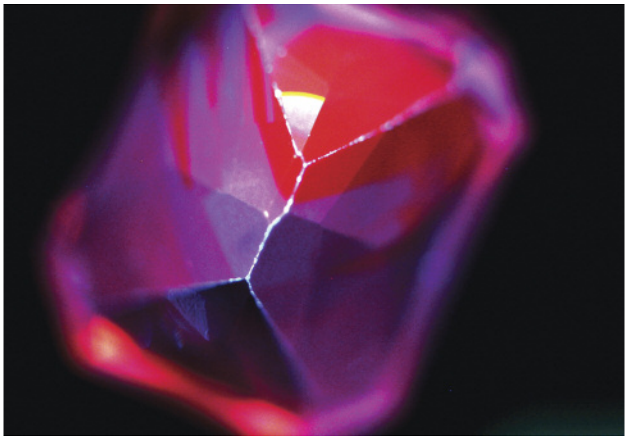


Figure 10. This 1.36 ct light bluish violet sapphire displayed an interesting color shift when exposed to the UV radiation of the DiamondView. Photo by Igor Iemelianov; magnified 15×.

Unusual optical effect in blue sapphire. A 1.36 ct light bluish violet sapphire (figure 10) was presented to the laboratory of the State Gemological Centre of Ukraine for examination. The stone exhibited an RI of 1.762–1.770, with a birefringence of 0.008, and a hydrostatic SG of 3.97. The samples displayed typical pleochroism and a very weak pinkish orange fluorescence to long-wave UV. Qualitative analysis using EDXRF spectroscopy showed major amounts of Fe, Cr, and Mg, and minor amounts of Ti and Ga. Microscopic examination revealed dot-like dissolved rutile, proof of heat treatment. The sapphire showed a small color shift from bluish violet in the daylight to pale blue in incandescent light. A band with pink luminescence (apparently due to Cr^{3+} impurity) was identified using the DiamondView (figure 11). When removed from the DiamondView,

Figure 11. The DiamondView recorded this band with pink luminescence in the light bluish violet sapphire. Image by Igor Iemelianov.



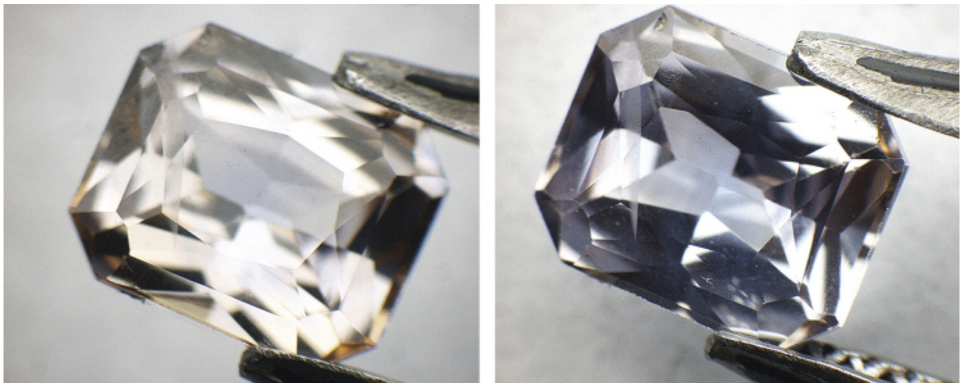


Figure 12. When removed from the DiamondView, the sapphire had completely turned brown (left). After about 12 hours, the stone reverted to its original light bluish violet color (right). Photos by Igor Iemelianov, magnified 15×.

the stone had completely changed color to brown (figure 12, left). After about 15 minutes in natural daylight, the light bluish violet hue began to return (figure 12, right). About 12 hours later, its original blue-violet color was restored. Such color instability is extremely unusual in blue sapphires.

It should be noted that the UV lamp in the DiamondView has a wavelength less than 225 nm (according to the user's manual). The energy of UV radiation is considered too weak for the color treatment of corundum (see K. Nassau, *Gemstone Enhancement*, Butterworth-Heinemann, 1984, p. 221). In this sapphire, the DiamondView apparently caused the color change. Such a reversible change of color with exposure to light is called photochromism.

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SYNTHETICS AND SIMULANTS

Assemblage of synthetic ruby in calcite matrix. Recently, the Dubai Central Laboratory received a white and cream-colored rough sample for identification (figure 13). The 124.4 × 107.7 × 65.8 mm, 5917.35 ct specimen had two openings, the larger one about 25 mm long and 10 mm wide. A hexagonal red stone embedded in the matrix could be seen through these openings (figure 14). Only the prism side was visible, and the rough concealed both terminations.

The red stone's refractive index and specific gravity were impossible to determine, and only a very small portion was visible for obtaining other information. A spectroscope was the only option, and the stone clearly showed a ruby spectrum. It also displayed strong and medium red reactions to long- and short-wave UV radiation, respectively. Microscopic examination with fiber-optic light revealed a group of round gas bubbles and tiny fractures, but curved striae were not seen. These properties indicated a flame-fusion synthetic ruby cleverly embedded in matrix to imitate natural ruby.

Raman spectroscopy identified the matrix as calcite. Close examination indicated that the cream-colored side of the stone had been drilled to make a hole for inserting the synthetic ruby. After the drilled area was sealed with a mixture of glue and calcite powder, two openings were cut

Figure 13. This synthetic ruby was fixed in a white and cream-colored matrix and represented as natural ruby. Photo by Sutas Singbamroong, Dubai Central Laboratory.

Figure 14. The synthetic ruby was embedded in a calcite matrix, seen here under incandescent light. Photo by Nazar Ahmed, Dubai Central Laboratory.

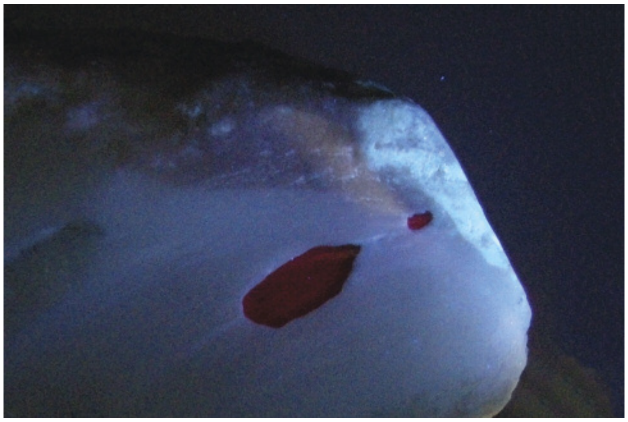

Figure 15. Under long-wave UV radiation, the drilled area showed strong greenish blue fluorescence. Photo by Nazar Ahmed, Dubai Central Laboratory.

to reveal the synthetic ruby inside. Under long-wave UV radiation, the drilled area showed strong greenish blue fluorescence, while the rest of the stone was inert or exhibited a light greenish blue reaction (figure 15).

These types of artificial assemblages should alert traders to exercise caution when purchasing rough stones, especially in newer, less established markets.

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Composite coral veneer glued to artificial matrix. Red coral, one of the most precious organic gems, has become increasingly popular in the Chinese jewelry market. With natural coral resources being depleted, ornaments of large size and high quality are becoming even more valuable. As a result, the market for treated red coral and imitation products is rapidly growing.

Composite red coral normally consists of coral fragments glued together with cement compounds. In 2010, the National Gemstone Testing Center Gem Laboratory in Beijing tested one bangle that was represented as red coral (Summer 2010 GNI, pp. 158–159). Because the client did not allow the lab to take a powder sample, further testing was restricted. There was some concern about whether the bangle had an artificial matrix, but this could not be determined without destructive tests.

Figure 16. These 14 ornaments, represented as red coral products, consisted of a coral veneer glued to a matrix. The ten bangles (top) weigh 37.34–57.43 g, and the four snuff bottles (bottom) range from 121.95 to 145.07 g. Photo by Haibo Li.

Recently, the NGTC received 10 bangles and four snuff bottles (figure 16) presented as red coral. The bangles resembled the one tested in 2010. Each of the 14 pieces was covered with a very thin surface layer of red coral. The composition of the material below this coral veneer was analyzed.

Magnification revealed the boundaries between the coral fragments and the cement compounds, which tended to be recessed (figures 17 and 18). This clearly demonstrated that the veneer was composite red coral. The coral

Figure 17. Left: A close-up of a bangle with coral veneer. Right: The bangle's inner surface is covered with rectangular coral slices, but gaps filled with cement compounds are still visible. Photos by Haibo Li; magnified 6.5×.

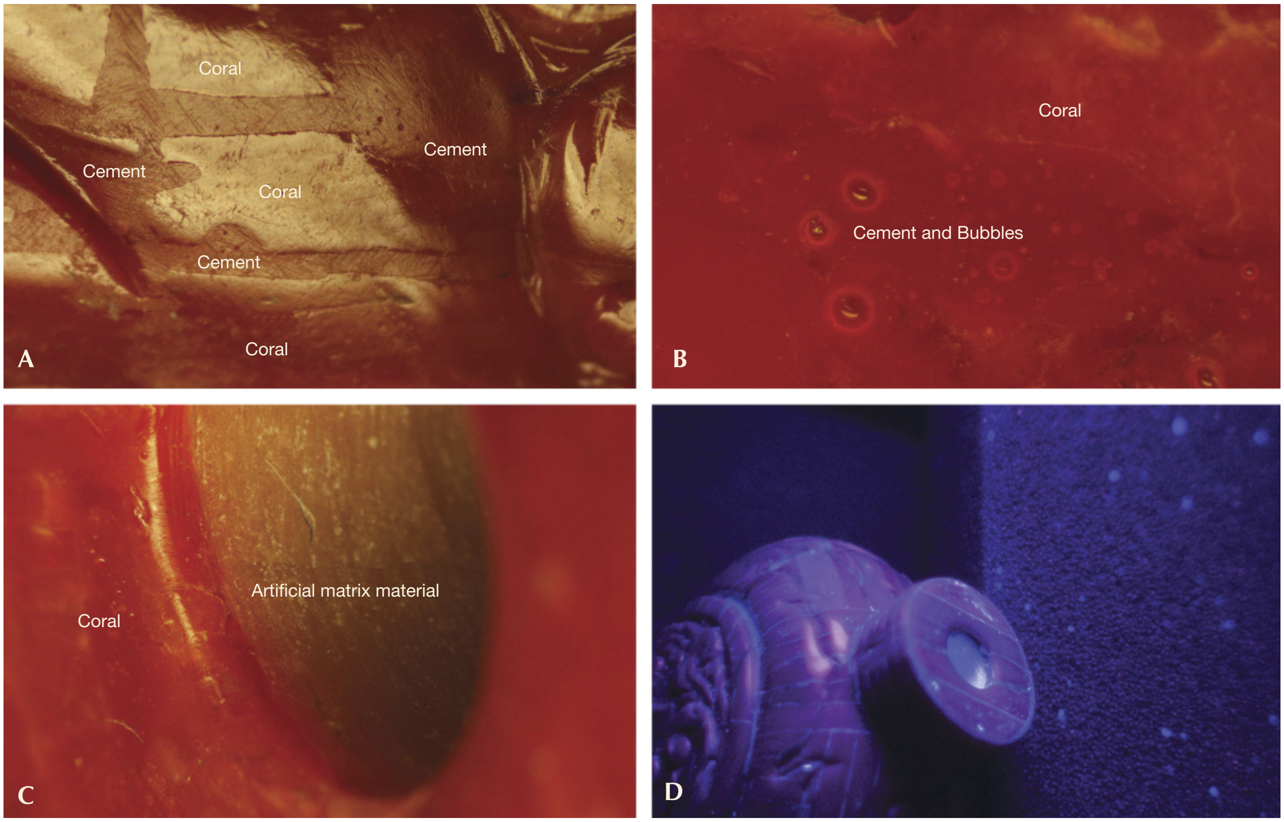

Figure 18. A: Reflected light showed the difference in luster between the cement compounds and the coral fragments; magnified 10×. B: Under transmitted light, air bubbles can be found in the cement compounds; magnified 20×. C: The boundary between the matrix and the composite coral veneer is very clear and sharp; magnified 10×. D: The fluorescence reaction of the same sample under short-wave UV. Photomicrographs by Haibo Li.

fragments had a vitreous luster and showed wavy growth patterns typical of natural coral. No growth patterns were seen in the cement compounds except for air bubbles.

Whitish material seen inside the neck of the bottles was identified as an artificial matrix. The composite red coral veneer, which was only about 1–2 mm thick, had been glued to the surface of the whitish matrix. Under a short-wave UV lamp, strong blue-white fluorescence from the cement compounds and the matrix was visible (figure 18).

Micro-infrared spectrometry (with 4.0 cm^{-1} resolution and 64 scans in the 675–4000 cm^{-1} range) identified the cement compounds as epoxy resin (figure 19A). Two different kinds of artificial matrix material were detected: ethyl cyanoacrylate (figure 19B) and alkyd synthetic resin mixed with carbonates. The main component of the carbonates was established as calcite by subtracting the spectra (figure 19C). The calcite could have come from the manufacturing process of the composite red coral.

The SG of the synthetic resin was about 1–2 g/cm^3, much lower than that of red coral (2.65 g/cm^3). Carbonates could have been added to the matrix to make it heavier and approximate the heft of coral. The snuff bottles all had similar size but different weights. The three that contained alkyd resin mixed with calcite, which has a relatively high SG, weighed 140–145 g. The matrix in the fourth snuff bottle was ethyl cyanoacrylate, which has a lower SG than calcite. As a result, it only weighed 121 g.

In today's market, oversized red coral products are often constructed from an artificial matrix. After the matrix is shaped, a veneer of red coral fragments is glued to its surface. This makes it easier to manufacture larger ornaments while preserving natural coral reefs. Combining magnification and UV fluorescence observation with infrared spectrometry, we can identify composite coral assemblages quickly and effectively.

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Dyed bone as a red coral imitation. Numerous materials have been widely used to imitate red coral: glass, plastic, ceramics, composites, and dyed shells. Recently, the Gem Testing Laboratory in Jaipur examined an 8.86 ct orange-red cabochon measuring 16.56 × 12.19 × 7.34 mm (figure 20) that was presented as red coral but proved to be dyed bone, an unusual imitation.

Initial observation showed a strong resemblance to red coral, but careful microscopic observation proved otherwise. The sample lacked the typical "tree ring" or striated growth structure seen in corals, though it did display a network of fine veins throughout. Viewed from above, these veins appeared subparallel and were oriented along the length of the cabochon (figure 21). The veins also displayed orange-red color concentrations against the cabochon's whitish bodycolor (again, see figure 21), suggesting that the

Figure 19. A: The IR spectrum of the cement compound in one of the bangles identified it as epoxy resin. B: The IR spectrum of the artificial matrix material in one of the snuff bottles indicated ethyl cyanoacrylate. C: The artificial matrix material in the other three snuff bottles was identified, by subtracting IR spectra, as alkyd resin mixed with carbonates.

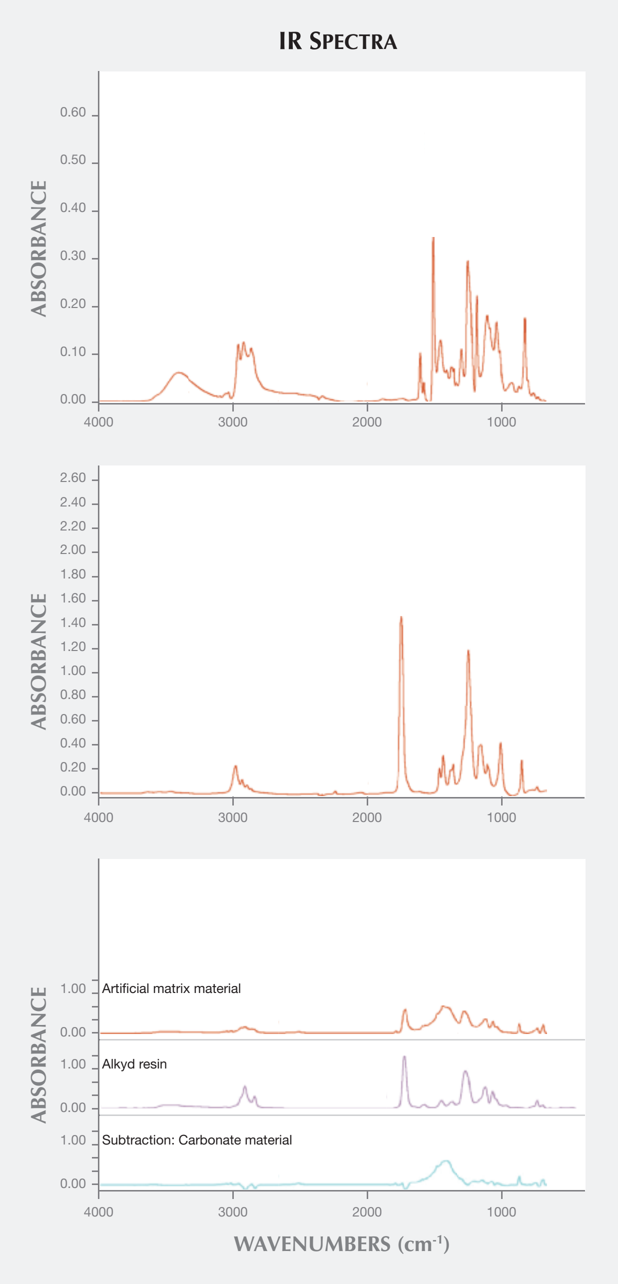
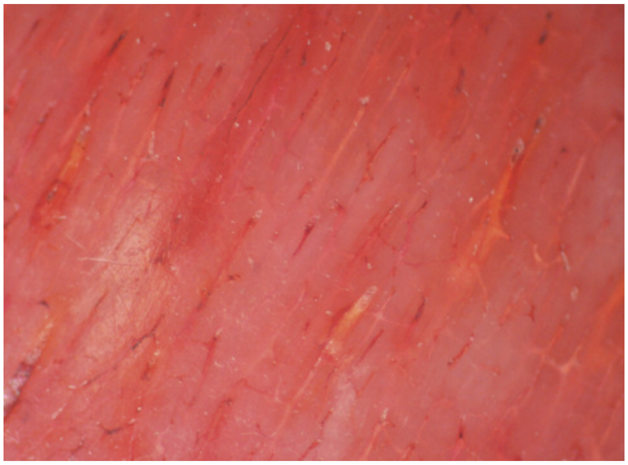


Figure 20. This 8.86 ct orange-red cabochon, submitted as coral, was identified as dyed bone. Photo by Gagan Choudhary.

Figure 21. The dyed bone illustrated in figure 20 displayed subparallel veins oriented along the length of the cabochon; also note the orange-red color concentrations against the sample's whitish bodycolor. Photomicrograph by Gagan Choudhary; magnified 48×.



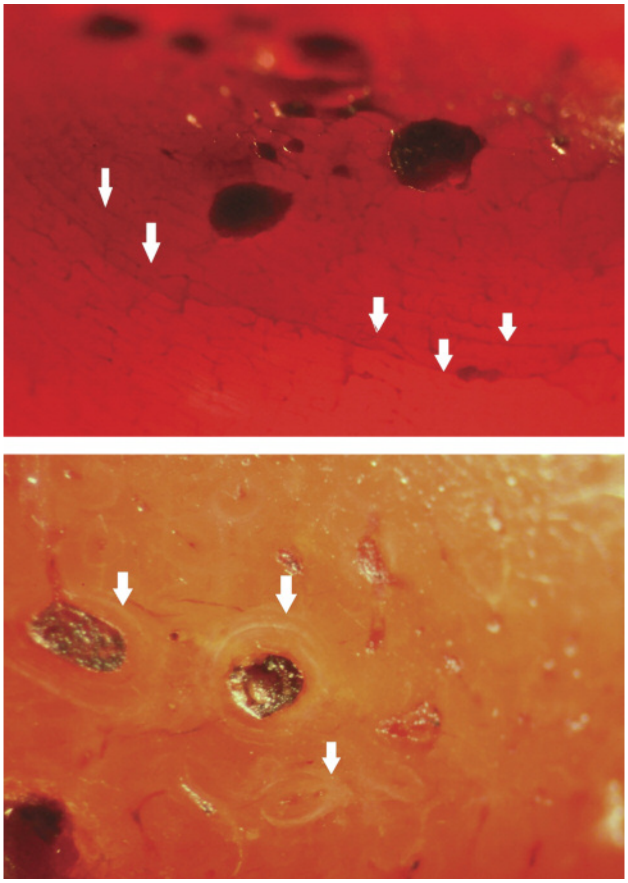


Figure 22. Subparallel veins were confined to circular concentric planes oriented along the length of the cabochon (top), while the individual veins were surrounded by concentric whitish rings (bottom). Photomicrographs by Gagan Choudhary; magnified 40× (top) and 56× (bottom).

material was both dyed and organic. Detailed observations of the sample from all sides revealed that the subparallel veins were confined to circular concentric planes oriented along the length of the cabochon (figure 22, top); the individual veins were further surrounded by concentric whitish rings (figure 22, bottom). These structural features ruled out the possibility of coral, but the identity had yet to be established.

The sample's spot RI was approximately 1.56, without any noticeable birefringence blink, while its hydrostatic SG was 2.01. Under a UV lamp, it displayed pinkish orange patchy fluorescence (which was stronger under long-wave UV). This characteristic is typically associated with dyes. Qualitative EDXRF analysis revealed the presence of phosphorus and calcium. Chemical, gemological, and observational features indicated bone, which was further confirmed by Raman spectroscopy. Raman spectra (figure 23) obtained using a 785 nm laser in the 200–2000 cm^{-1} region displayed a strong peak at approximately 960 cm^{-1}, with weaker peaks at approximately 430, 586, and 1072 cm^{-1}. Also present were a few indistinct features in the 1200–1700 cm^{-1} region. The peaks at approximately 960, 586, and 430 cm^{-1} were attributed to PO_4^{3-} bending and stretching, and the one at 1072 cm^{-1} to CO_4^{3-} stretching. The indistinct features between 1200 and 1700 cm^{-1} were due to collagen—the essential component of bone tissue (C. Kontoyannis et al., "Analysis of bone composition with Raman spectroscopy," *Proceedings of the 13th Panhellenic Pharmaceutical Congress*, 2012, http://nemertes.lis.upatras.gr/jspui/bitstream/10889/5187/1/PMO031.pdf).

Bones have been used as jewelry since ancient times, and some specimens are dyed or stained to make them appear older (Summer 2006 Lab Notes, p. 160). Bone is used to imitate ivory, but this is the first time we have seen a bone dyed red and presented as coral, an interesting and unusual imitation. Although the market penetration of this material is unknown, we cannot rule out the possibility of it being mixed in packets of red coral, and this separation would pose a challenge for jewelers and gemologists.

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MORE FROM TUCSON 2014

Bumble Bee "jasper" from Indonesia. At the Tucson Gem and Mineral Show, All in Vein (Quartzsite, Arizona) exhibited slabs and pairs of Bumble Bee "jasper," which was sold elsewhere at the show as Eclipse "jasper." The term *jasper* is a misnomer, as this vibrantly colored orange, yellow, and

Figure 23. The bone's Raman spectrum showed major PO_4^{3-} peaks at about 960, 586, and 430 cm^{-1}; a CO_4^{3-} peak at 1072 cm^{-1}; and collagen-related peaks in the 1200–1700 cm^{-1} region.

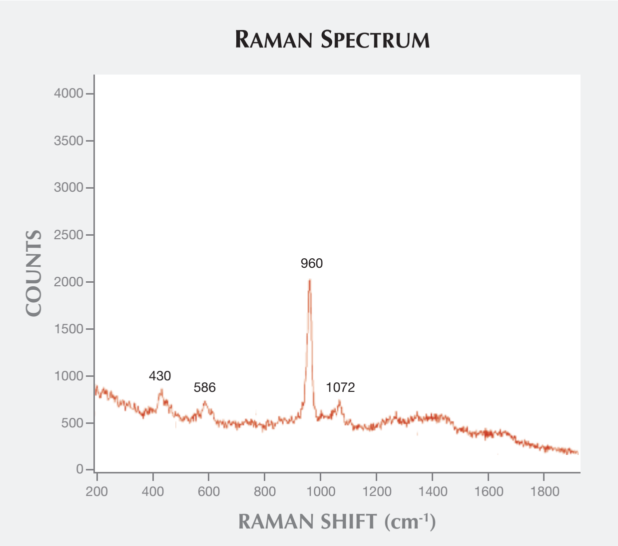

Figure 24. This Bumble Bee "jasper," measuring 32 × 54 mm, is a mixture of volcanic lava and sediment. Photo by Robert Weldon/GIA; courtesy of Robert E. Kane.

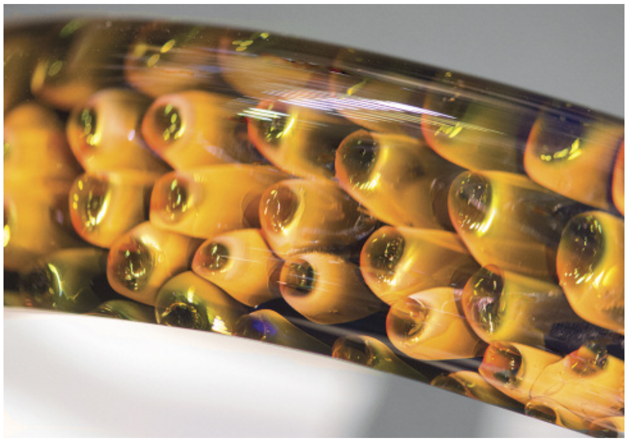

Figure 26. This Pyrex bracelet displays a striking orbicular pattern that appears three-dimensional. Photo by Eric Welch; courtesy of Kevin O'Grady.

black material (figure 24) actually formed from a mixture of Indonesian volcano lava and sediment. A carbonate-rich rock first discovered on the island of Java during the 1990s, the material is soft, with a Mohs hardness of 5 or below. The porous rock is easily cut and polished, and most specimens are filled with Opticon (H. Serras-Herman, "Bumble Bee 'jasper': A colorful volcanic lapidary material," *Rock & Gem*, Vol. 43, No. 8, pp. 26–29).

Stuart Overlin

Pyrex bracelets. At the Pueblo Gem & Mineral Show, Kevin O'Grady (Scottsdale, Arizona) exhibited a line of glass bracelets and other jewelry (figures 25 and 26). O'Grady has worked with borosilicate glass, better known by the brand name Pyrex, since the late 1980s. He touted the durability and versatility of this medium, which lends itself to a variety of dramatic effects. He crafts each piece freehand using a torch, adding elements such as cobalt to achieve colors and embedding flower mosaics and other patterns that appear three-dimensional. O'Grady's signature bracelets contain gold, silver, or a combination of both.

Stuart Overlin

Shattuckite from the DRC. At the Tucson Gem and Mineral Show, Brett Kosnar of Mineral Classics (Black Hawk, Colorado) exhibited rare specimens of shattuckite from the Democratic Republic of Congo. A new find of this intense medium to dark blue copper silicate (figure 27) occurred in the Kambove District in October 2013. The mineral has a Mohs hardness of 3.5 and is used for cabochons and carvings. Shattuckite has been reported from various African and European sources, as well as copper mines in the

Figure 25. Pyrex bracelets with attractive colors and patterns were on display at the Tucson show. Photo by Eric Welch; courtesy of Kevin O'Grady.

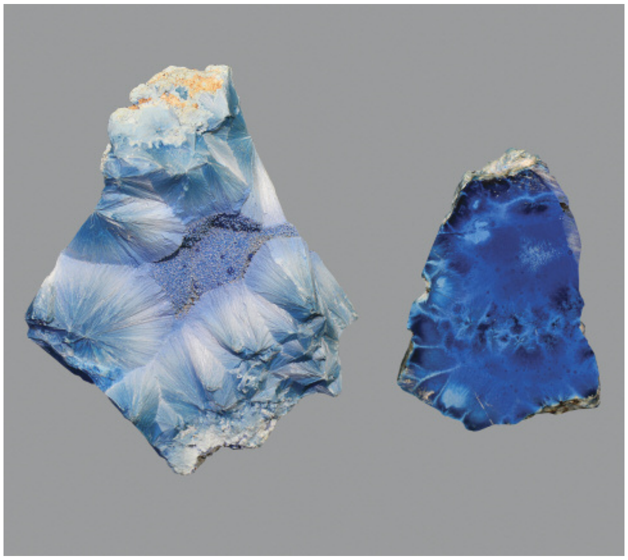

Figure 27. These intense blue shattuckite specimens are from a recent find in the Democratic Republic of Congo. Photo by Brett Kosnar; courtesy of Brett Kosnar, Kosnar Gem Co.

American West. The type locality is the Shattuck-Denn mine in Bisbee, Arizona (R. Bowell and R. Cook, "Connoisseur's Choice: Shattuckite: Kunene District, Kaokoveld, Namibia," *Rocks & Minerals*, Vol. 84, November/December 2009, pp. 544–550).

Kosnar's Congolese shattuckite is being stabilized prior to jewelry manufacturing. He plans to debut cabochons of this very limited material at Tucson in 2015.

Stuart Overlin

Figure 28. Top-quality stones, including purple and green jade, were offered at Jewelry Shanghai 2014. Photo by Jennifer Stone-Sundberg.

Figure 29. This clear quartz carving seen at the Shanghai show demonstrates the exceptional craftsmanship sought by Chinese collectors. Photo by Jennifer Stone-Sundberg.

CONFERENCE REPORT

Jewelry Shanghai 2014. Organized by the Gems & Jewelry Association of China, Jewelry Shanghai 2014 took place May 8–12 at the Shanghai World Expo Exhibition & Convention Center. The two exposition halls held over 1,000 vendors representing more than 22 countries in 4,200 square meters of exhibitor space. A wide variety was offered, including exceptional examples of tourmaline, jade (figure 28), and ruby, as well as phenomenal stones such as cat's-eye chrysoberyl and star sapphire. Additionally, superb craftsmanship was on display in the form of fine jade and quartz carvings (figure 29), gold work, and cloisonné enameling. This year saw the addition of top-level fossil, mineral, and gem collector specimens. Other popular items for sale were amber, turquoise, and moonstone.

The show featured lectures on topics such as Chinese jade carving, diamond, and Burmese rubies. As Shanghai is

Figure 30. "Fantastic Cross," an 18K gold brooch featuring turquoise, variscite, chrysocolla, cultured pearl, and enamel, is part of the museum display at GIA's New York laboratory and campus. Photo by Orasa Weldon/GIA, courtesy of the Anthony and Elizabeth Duquette Foundation for the Living Arts.

China's diamond import center, the Shanghai Diamond Exchange (which handles every diamond imported into the country) and the Hoge Raad voor Diamant (HRD) were present. Several other gem- and jewelry-related agencies, including the Shanghai Gold Exchange and the International Gemological Institute (IGI), also attended. Mainland China posted jewelry retail sales of 295.9 billion yuan (approximately US$47 billion) in 2013 (http://www.stats.gov.cn/tjsj/zxfb/201401/t20140120_502082.html), and this show certainly indicated the quality and diversity of items the Chinese gem and jewelry market demands today.

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MISCELLANEOUS

GIA Museum exhibits in New York. GIA's recently opened laboratory and campus at the International Gem Tower in New York's Diamond District features a permanent museum exhibit of gems, jewelry, and mineral sculptures. Fourteen display cases highlight nearly 100 items from the GIA collection, ranging from large aquamarine crystals to a diminutive *objet d'art* golden cactus and a necklace featuring akoya, Tahitian, and South Sea cultured pearls (figure 30). The exhibit showcases the wonder of gems to visitors and students.

ERRATUM

In the Gem News International section of the Spring 2014 issue, the photographer of the large oolitic opal block should have been listed as Don Mengason.