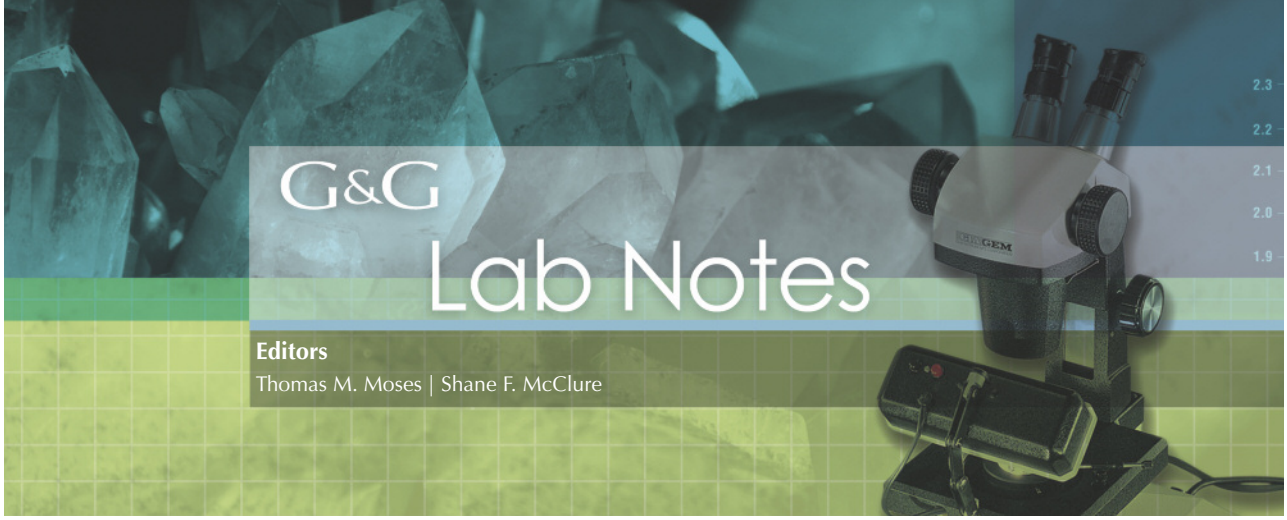


Pink and Reddish Purple COBALTOCALCITE

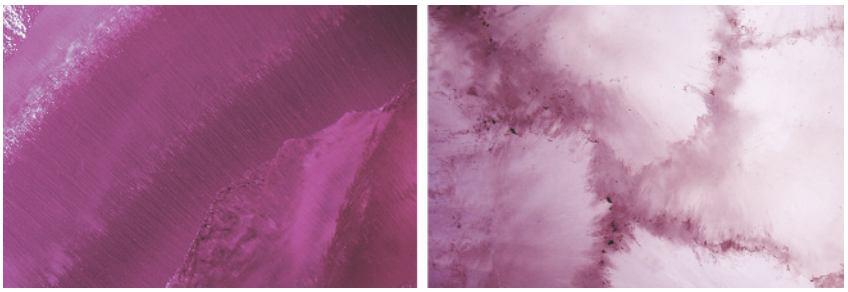
Cobaltocalcite is a pink to purple variety of calcite. The mineral is popular as a collector's item because of its striking purplish pink color, which is caused, as the name suggests, by the presence of cobalt. Cobalt occurs in calcite in octahedral coordination as Co^{2+} (E. Fritsch and G.R. Rossman, "An update on color in gems. Part 1: Introduction and colors caused by dispersed metal ions," Fall 1987 *G&G*, pp.126–139).

Recently, GIA's laboratory in Bangkok examined the botryoidal purplish pink and rough reddish purple cobaltocalcite specimens shown in figure 1. Gemological properties were obtained from both, and we also prepared several polished wafers for advanced testing.

Standard gemological testing of these translucent stones revealed strong double refraction with an RI of 1.49–1.66 (as expected for a carbonate material) and an SG of approximately 2.70. The reddish purple cobaltocalcite exhibited a very weak purplish pink reaction to long-wave UV radiation and an inert reaction to short-wave UV. The purplish pink stone had a moderate orangy pink reaction to long-wave UV and weak pink to short-wave. Magnification revealed white particulate flakes of a fibrous nature forming bands in the reddish purple specimen, while the purplish pink one contained pronounced irregular fibrous inclusions forming a mosaic pattern in areas (figure 2).

Figure 1. The pink and reddish purple cobaltocalcite specimens (246.3 and 361.0 g, respectively) are shown with some of the wafers cut from them.

Figure 2. Left: The reddish purple cobaltocalcite showed a banded structure formed by white particles with a fibrous appearance. Field of view 4.1 mm. Right: Irregular bands of fibrous inclusions in the pink stone formed a mosaic pattern. Fiber-optic illumination, field of view 4.1 mm.



Editors' note: All items were written by staff members of GIA laboratories.

Gems & Gemology, Vol. 51, No. 1, pp. 58–67.

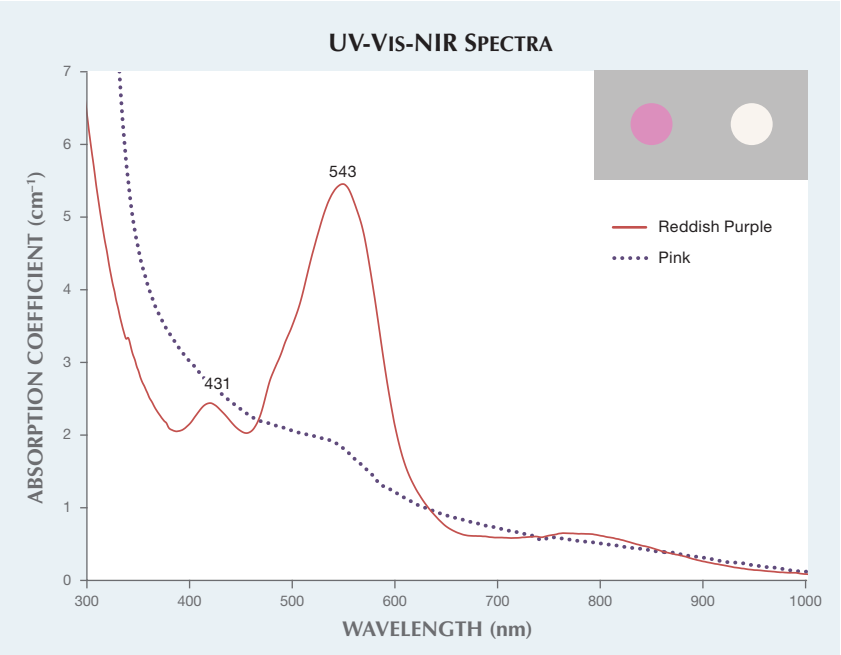


*Figure 3. UV-Vis-NIR spectra in the 300–1000 nm region showed broad absorption bands at approximately 431 and 543 nm in the reddish purple cobaltocalcite, and a weak broad band at 543 nm in the pink stone. Inset: The reddish purple and pink stones' CIE L*a*b* color coordinates (71, 47, 24 and 96, 3, 4, respectively) are reproduced from their UV-visible spectra.*

The UV-Vis-NIR spectrum of the reddish purple cobaltocalcite wafer (figure 3) showed a dominant absorption band at 543 nm and a small peak at 431 nm. The pink wafer only showed a weak absorption feature at 543 nm. Color calculations (see box A in R. Lu, "Color origin of lavender jadeite: An alternative approach," Winter 2012 *G&G*, pp. 273–283) were consistent with the respective reddish purple and purplish pink color of the two specimens (figure 3, inset).

Elemental analysis was performed using laser ablation–inductively coupled plasma–mass spectrometry (LA-ICP-MS). Besides the main constituent calcium, both the reddish purple and the purplish pink cobaltocalcites showed significant amounts of Co at 5673 and 730 ppmw, respectively. The reddish purple sample's higher concentration is consistent with a higher Co level produces a more saturated color. The concentration of Co is consistent with the intensity of the 543 nm absorption bands in the visible region of both samples. The purplish pink cobaltocalcite also showed 8719 ppmw of Mn. Manganese can cause pink to purple color in appropriate concentrations, so its contribution to the purplish pink color in this material may require further analysis.

Piradee Siritheerakul and Supharart Sangsawong

DIAMOND

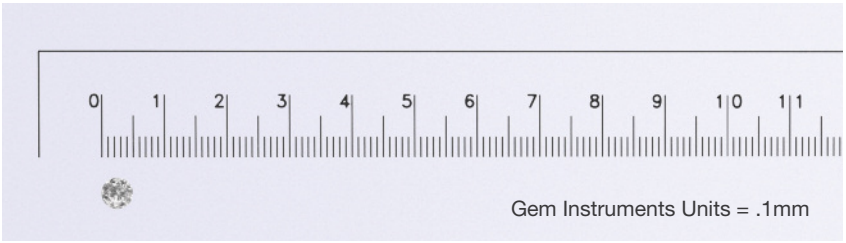
Analysis of Melee Diamonds Using FTIR Spectroscopy

The jewelry industry has expressed increasing concern over the possibility of treated or synthetic diamonds being mixed in with natural melee goods (those weighing less than 0.20 ct). Recently, GIA's laboratory has seen a surge in notably small faceted melee diamonds submitted for identification. In melee sizes less than 0.01 ct, a standard Fourier-transform infrared (FTIR) spectrometer provides a less stable environment for analysis and produces an indistinct spectrum. Diamonds smaller than 0.01 ct prove challenging for other screening devices as well. Meanwhile, there is heightened pressure to identify both loose and mounted melee diamonds in the laboratory quickly and reliably so that each stone can be analyzed. In late 2014, GIA developed a new protocol to use an FTIR microscope to focus on melee diamonds as small as 0.00054 ct (figure 4) to produce high-quality spectra suitable for diamond typing.

Operating the FTIR microscope in reflection mode allows for fine-tuned aligning of the beam within a sample, improving the detail of the infrared spectra. Once a faceted round brilliant melee is stationed on a slide, the microscope beam can be focused either through the pavilion (if the melee is table-down) or through the table at an angle to reflect off an inner pavilion facet (if the melee is resting on the pavilion). Many of the samples were so small that the position of the stone remained unknown until the microscope was focused. Nevertheless, spectral quality was independent of stone position.

All 70 melee examined were natural round brilliants, the smallest a

Figure 4. This 0.00054 ct colorless round brilliant was submitted for identification as a natural or synthetic diamond. Despite the specimen's small size, an FTIR microscope can focus a beam through the facets to capture a high-quality infrared spectrum.



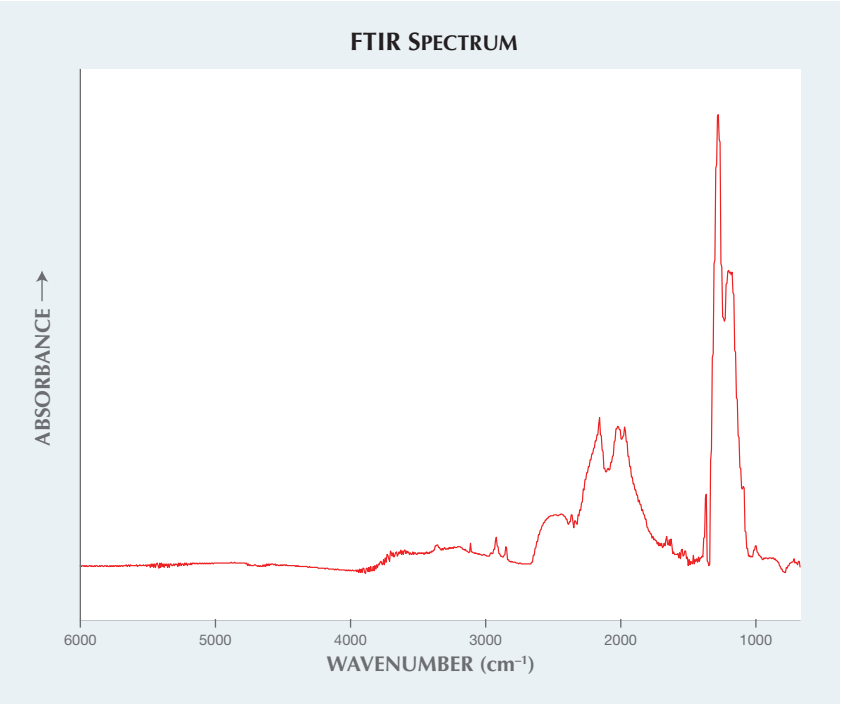


Figure 5. This infrared spectrum of the 0.00054 ct diamond in figure 4, obtained using an FTIR microscope, shows the detail that can be captured from very small melee sizes.

0.00054 ct colorless sample identified as a type Ia diamond (figure 5). A few screening devices for treatment and synthetics have been introduced for diamonds over 0.01 ct. The FTIR microscope has proved very effective in analyzing melee smaller than this size, either loose or mounted.

The knowledge that GIA can type such small stones and determine their origin, either loose or mounted, apart from being an impressive test of FTIR microscopy, will increase consumer confidence in these remarkable melee diamonds.

Rachel Sheppard, Tom Moses, and Wuyi Wang

Artificially Irradiated Color-Change Diamonds

Diamonds that exhibit a temporary color change, commonly referred to as "chameleon" diamonds, are rare in nature. Their color changes with gentle heating, or when they are left in darkness for a period of time. The change from a dark greenish to a lighter yellow hue upon gentle heating is due to the thermochromic properties of these diamonds (D.J. Content, Ed., *A Green Diamond: A Study of Chameleonism*, W.S. Maney & Son, Leeds, England, 1995, 42 pp.).

Recently the New York laboratory examined two chameleon diamonds, a 0.35 ct Fancy Deep yellow-green marquise and a 0.27 ct Fancy Deep grayish yellowish green marquise (figure 6). Spectroscopic analysis and gemological observations confirmed that these were typical chameleon diamonds. After excitation with short-wave UV light, both exhibited a strong blue to yellow phosphorescence often seen in natural chameleon diamonds. Their UV-Vis absorption spectra showed a broad band at about 480 nm, as expected for this type of diamond. But the spectra also displayed a peak at 741 nm (figure 7), known as GR1 (general radiation damage), that can contribute to a green color in diamonds. Because this radiation-related feature is not found in untreated natural chameleon diamonds, we concluded that both stones had been artificially irradiated.

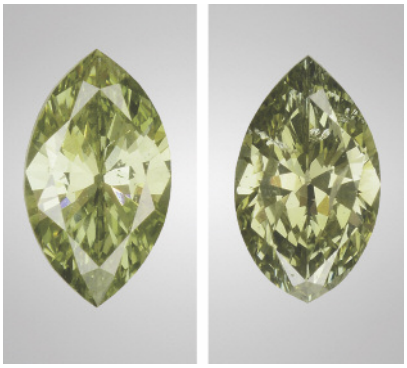
A chameleon diamond is an unlikely candidate for artificial irradiation treatment to enhance the stone's green or blue bodycolor. It is likely that this property was not known or understood before the irradiation process. A permanent color change may occur if these treated chameleon stones are heated for a prolonged period, so it is important to exercise caution during testing. Because the diamonds' original colors are unknown, they were issued reports stating that they had been artificially irradiated to enhance their color.

Sally Chan, Jessie Yixin Zhou, and Paul Johnson

Diamond in Diamond

The New York laboratory recently examined a 1.69 ct Fancy black round brilliant diamond (figure 8). The type Ia diamond contained an abundance of tiny cloud inclusions and strong hydrogen-related absorptions, both common features for this type of diamond. We observed numerous etch channels with brown radiation staining, also normal features for diamonds of this type and color. But we also observed a sizable octahedral crystal inclusion that broke the surface of a pavilion facet (figure 9, left). The surface-breaking area was approximately 150 × 250 microns according to the Raman microscopic

Figure 6. These two chameleon diamonds (0.35 and 0.27 ct) were color-treated with artificial irradiation.



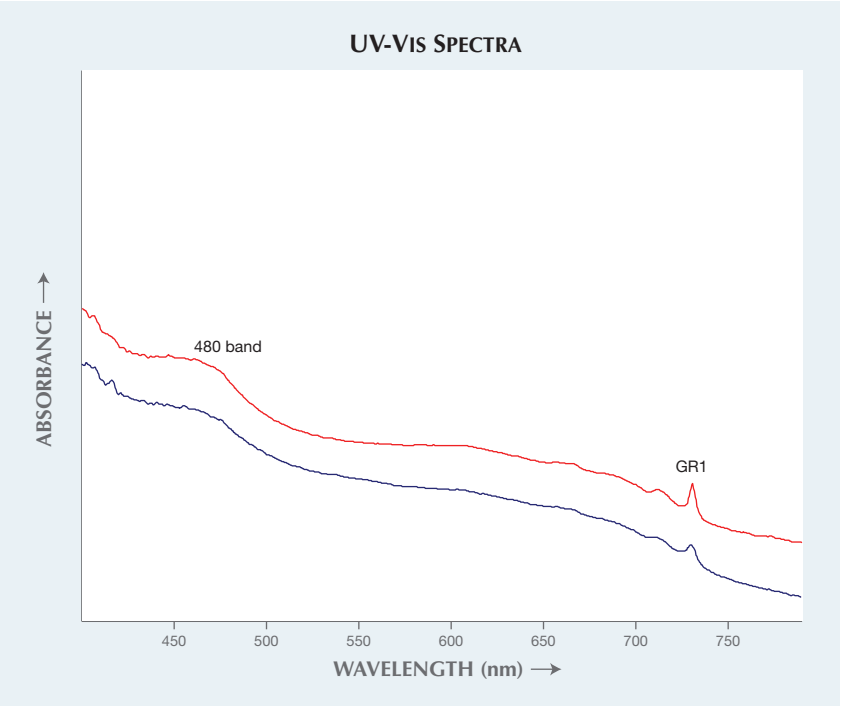


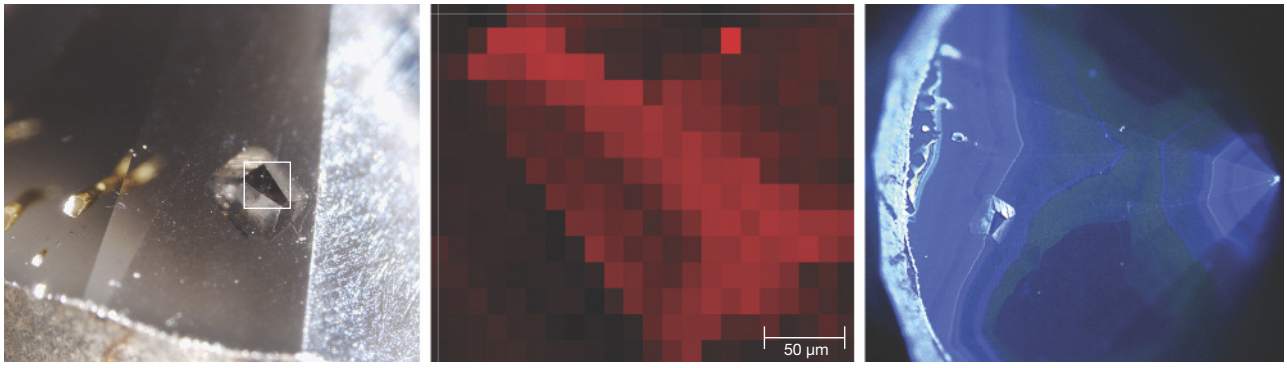
Figure 7. The UV-Vis spectra for the two chameleon diamonds show a broad absorption peak around 480 nm and an atypical GR1 feature at 741 nm.

image. The actual dimensions of the entire included crystal could not be determined.

The exposed crystal inclusion had the morphology of a natural diamond crystal, and Raman analysis easily identified it as diamond. Both the host diamond and inclusion show sharp 1332 cm^{-1} Raman bands, indicating high crystallinity. The graphite peak at approximately 1580 cm^{-1} was not observed in either. Raman mapping showed that the full width at half-maximum (FWHM) of the inclusion's 1332 cm^{-1} peak was different from that of the host diamond (figure 9, center). In the map, each colored pixel represents the FWHM value of the 1332 cm^{-1} Raman peak. The colored pixels of the inclusion were decidedly different from those of the host dia-

Figure 8. This 1.69 ct Fancy black round brilliant diamond contained an octahedral diamond crystal.

Figure 9. Left: This photomicrograph reveals natural etch channels with brown radiation staining, as well as an octahedral crystal inclusion (the inset shows the surface-breaking outline). Center: The Raman map of the 1332 cm^{-1} FWHM clearly outlines the surface break of the octahedral diamond inclusion. The inset in the left-side image represents the Raman mapping area. The image was taken in a grid pattern measuring FWHM of the diamond Raman peak at 1332 cm^{-1}. More than 300 Raman spectra collected at multiple points on the grid were translated into this map by the software. Each colored pixel represents the FWHM value, and similar FWHM values will be shown in similar colors. Noticeably different colors outlining the inclusion indicate that it is not part of the host diamond and that it formed in a different geological environment. Right: DiamondView imaging shows that the diamond inclusion was captured during the second phase of growth.



mond, confirming that it formed in a different geological environment. We also observed differences between the photoluminescence (PL) spectra of the inclusion and the host diamond, evidence that the diamond inclusion formed in a different environment and was later incorporated as a protogenetic inclusion. This also suggests that this diamond may have traveled from its original formation environment to another geological environment after crystallization.

A DiamondView image shows the diamond crystal to have been captured in a second growth phase of the host diamond crystal (figure 9, right). This is the first documented case of a diamond crystal inclusion with a different origin than that of the host diamond.

Paul Johnson and Kyaw Soe Moe

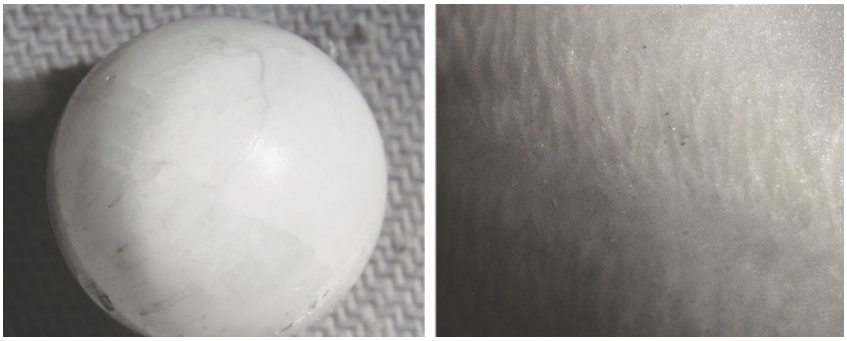


Figure 10. Left: This white shell bead (10.08 mm) was visible after the coating was removed from one of the imitation pearls. Right: A subtle flame structure was observed on the surface of the shell bead; magnified 40×.

PEARLS

Conservation Concerns over Use of *Tridacna* Shell in Imitation Pearls

Last year the New York laboratory reported on the use of shell as a pearl imitation (Summer 2014 Lab Notes, pp. 153–154) and the improper nomenclature applied by those marketing it. We decided to delve deeper and investigate the nature of the shell beads used in such imitation pearls following correspondence with Dr. Henry A. Hänni, who previously reported on this issue (see Summer 2004 Gem News International, p. 178, and references within).

After removing the outer coating on one of the imitation pearls by immersing it in acetone, we observed a banded white bead (figure 10, left). Magnification revealed fine and subtle flame structures (figure 10, right), indicating the bead was most likely fashioned from the shell of a *Tridacna* (giant clam) species.

All species of the Tridacnidae family are currently listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Some species, such as *Tridacna gigas*, are more vulnerable than others, such as *Tridacna squamosa* or *Tridacna maxima*. These large saltwater clams can have heavy shells fluted with multiple folds (figure 11) and colorful mantles. Their natural habitats lie in the warm marine waters of the Indo-Pacific, a fragile region that has been heavily impacted by human activities.

These beautiful marine animals are commonly harvested from their natural habitats or aquaculture farms for food (*Center for Tropical and Subtropical Aquaculture Publication No. 114*, University of Hawaii), and their shells are fashioned into beads or ornaments that are prized by some cultures. Despite their protection under CITES, these shell products are readily available on the Internet and often very inexpensive (figure 12). Imitation

Figure 11. These three shells of Tridacna *species are part of the collection at GIA's Bangkok laboratory. The two largest measure approximately 33 × 20 cm each. The two larger shells were found empty by Thai divers, while the smaller shell was donated to the Bangkok lab several years ago and comes from an unknown source.*

Figure 12. Tridacna *shell beads of various sizes (4.5 to 10.5 mm) are readily available from various commercial sites. The carved beads shown on the left are marketed as "Tibetan prayer beads."*

Figure 13. This northern quahog pearl exhibited a fine color and shape.

shell "pearls" fashioned from these endangered and protected mollusks do not offer any obvious advantages over common freshwater mussel shells, and it is extremely difficult to identify the exact *Tridacna* species or whether the mollusks were farmed or harvested from the wild. We urge manufacturers to stop using *Tridacna* shell beads when producing imitation pearls.

Jessie Yixin Zhou and Chunhui Zhou

Large Natural Quahog Pearl

A notable purple non-nacreous pearl (figure 13) recently submitted to GIA's New York laboratory measured 13.69 × 11.80 mm and weighed 16.64 ct. It was immediately recognizable as an outstanding specimen due to its clean surface, which possessed an attractive sheen reminiscent of fine porcelain. It had good symmetry, featuring a near-round button shape with a perfect dome top and a rounded base, and a richly saturated and well-distributed mid-purple color.

Real-time microradiography revealed a tight internal structure, a common characteristic of certain natural non-nacreous/porcelaneous pearls. Raman spectroscopy using 514 nm laser excitation (figure 14) showed characteristic aragonite peaks at 702, 706, and 1086 cm^{-1}, as well as 1130 and 1520 cm^{-1} peaks related to a mixture of polyenic (polyacetylenic) compounds, the natural pigments responsible for its purple color, as previously observed in similar pearls (Winter 2008 GNI, pp. 374–375). The characteristic natural purple color and non-nacreous porce-

Figure 14. The quahog pearl's Raman spectrum showed the typical aragonite peaks seen in most pearls, together with 1130 and 1520 cm^{-1} peaks related to a natural coloring compound.

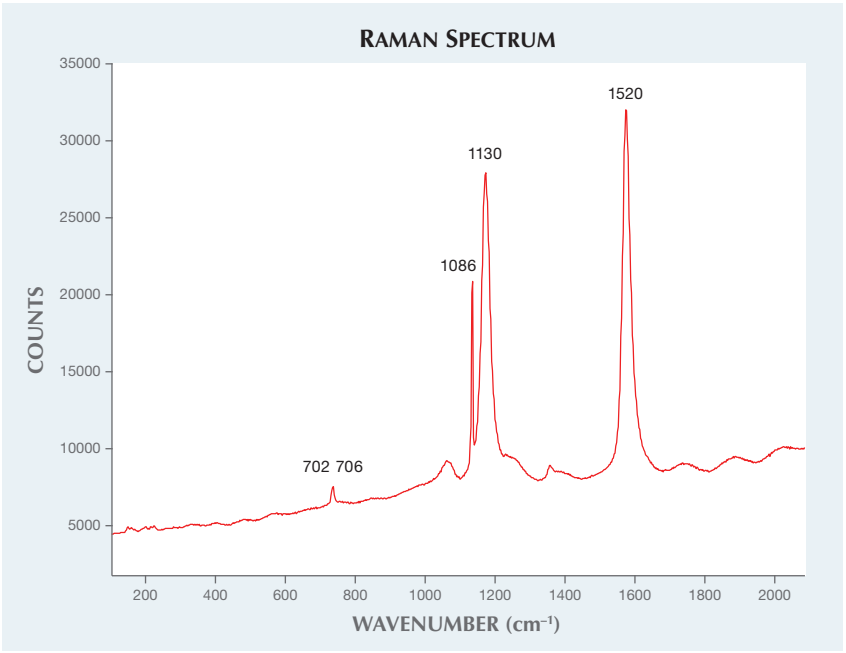


Figure 15. This quahog shell from the eastern coast of the United States has a naturally attached pearl.

laneous appearance indicated a pearl from the bivalve mollusk *Mercenaria mercenaria* (belonging to the Veneridae family), also referred to as the "northern quahog."

Quahogs are native to the Atlantic shores of North America from Canada to Georgia, especially on the coast of the New England states, and can also be found along California's Pacific coast. They can produce nonnacreous porcelain-like pearls, and their shells typically exhibit an uneven white and purple interior color (figure 15). Quahog pearls may occur in a variety of colors ranging from white to brown and from faint pinkish purple to dark purple. Like other natural pearls, quahog pearls are rarely spherical. Button shapes with flat bases are most often encountered.

Natural northern quahog pearls are often submitted to GIA labs. Most are below 10 carats with a flat-based button shape, usually with a dark or light purple color, and tales of their accidental discovery while eating clams are not uncommon. This quahog pearl's large size, clean surface, fabulous luster, near-round shape, and evenly distributed rich color combine to make it an exceptionally fine and rare example of its type.

Joyce Wing Yan Ho

SYNTHETIC DIAMOND

HPHT Synthetic Diamond Melee in High-Quality Jewelry Piece

Advances in the laboratory growth of diamonds have led to an increase in the number of synthetic diamonds seen at GIA. The existence of high-quality synthetic diamonds in melee sizes is of particular concern. This is due in part to the expense of examining melee relative to their value. While GIA can reliably identify synthetic melee, this requires individual analysis of each stone, preferably before mounting. In a complicated piece with hundreds of melee, this can be prohibitively expensive or time-consuming. The same is true for melee parcels. A synthetic diamond mixed into a packet may not be identified until later, deceiving dealers, jewelers, and consumers and potentially causing damage to the trade.

Recently, a pendant with 118 mounted stones was submitted to GIA's New York laboratory for color origin analysis of each individual melee (figure 16). The pendant consisted of a central pear-shaped stone surrounded by three consecutive rows of round brilliant melee. Of the 118 stones, 58 were fancy yellow, including the center stone, and 60 were colorless. Using a Fourier-transform infrared (FTIR) microscope in reflection mode allowed detailed focusing of the infrared beam on the mounted stones, including those that were partially obscured. Analysis was carried

Figure 16. A photo and a detailed illustration of the melee-set pendant show the location of all 118 samples. The single HPHT synthetic melee is highlighted in both images.

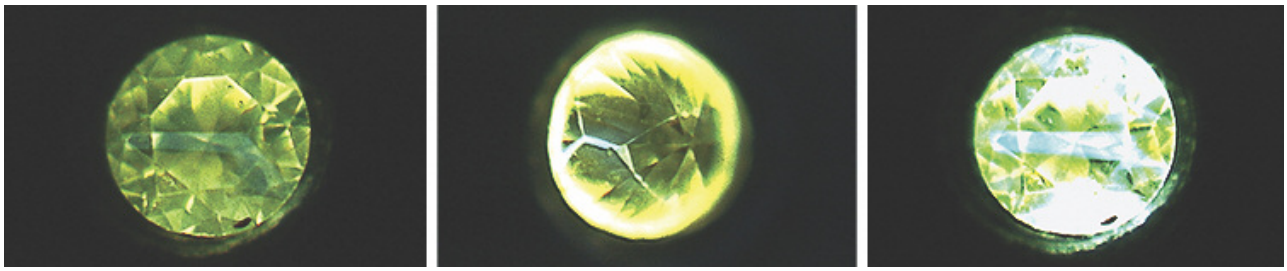


Figure 17. Left and center: DiamondView fluorescence images of the 0.00431 carat type Ib diamond show clear cuboctahedral HPHT synthetic growth sectors. Right: The sample's strong phosphorescence is atypical for a diamond of this type and color.

out on a Thermo Nicolet iN10 FTIR microscope, which determined the diamond type classification of each melee stone from its mid-IR absorption spectra (C.M. Breeding and J. E. Shigley, "The 'type' classification system of diamonds and its importance in gemology," Summer 2009 *G&G*, pp. 96–111). One melee was identified as an HPHT-grown (high-pressure, high-temperature) synthetic diamond, based on its infrared spectrum as well as its color, fluorescence pattern, and phosphorescence behavior. This 0.00431 ct melee was removed from the setting to confirm its origin as HPHT-synthetic. The rest were confirmed as natural diamonds.

Of the 118 melee, 114 were classified as type IaA or type IaAB. These were characterized by absorption from aggregated nitrogen centers, where A-centers (nitrogen pairs) and B-centers (four nitrogen atoms symmetrically surrounding a vacant lattice site) absorb infrared light at 1282 and 1174 cm^{-1}, respectively. These spectra revealed sufficient A-center concentrations, eliminating the possibility of HPHT treatment, which would have deaggregated the centers into isolated nitrogen atoms (A.T. Collins, "The colour of diamond and how it may be changed," *Journal of Gemmology*, Vol. 27, No. 6, 2001, pp. 341–359). Since A- and B-center absorptions occur solely in the infrared range, their presence does not produce color. Instead, the yellow color observed in 57 of these type IaA/IaAB stones resulted from absorption from the N3 defect at 415 nm (a complex of three nitrogen atoms surrounding a vacancy) and associated peaks at 453, 452, 465, and 478 nm. This spectrum is known as the "Cape series," and such goods are commonly referred to as "Cape yellow."

Two colorless stones were classified as type IaB, showing only pure B-aggregate absorption; the remaining colorless stone was type IIa, meaning it did not show IR absorption from any nitrogen-related impurities. Finally, a partially obscured yellow stone near the bottom of the piece was type Ib, showing absorption due to isolated nitrogen impurities, and characterized by features at 1130 and 1344 cm^{-1}. Isolated nitrogen centers also produce a broad absorption feature in the UV-visible range (approximately 270 nm), resulting in a coloration often described as "Canary yellow." Type Ib diamonds are very rare, representing only 0.1% of all natural diamonds (R. Tappert and M.C. Tappert, *Diamonds in Nature*, Springer, Berlin, 2011). Conversely, this diamond type is common in yellow synthetic diamonds. Due to the absence of A-centers, these four samples required further testing.

Photoluminescence spectroscopy confirmed that the type IaB and IIa stones were natural in origin. However, the type Ib stone (marked in figure 16) was further examined with DiamondView imaging, which showed that it exhibited strong yellow-green fluorescence under deep ultraviolet illumination (wavelength <230 nm) and indicated growth sector patterns typical of HPHT synthetic diamonds, as well as strong blue phosphorescence inconsistent with natural yellow type Ib diamonds (J.E. Shigley et al., "A chart for the separation of natural and synthetic diamonds," Winter 1995 *G&G*, pp. 256–264; J.E. Shigley et al., "Gemological properties of near-colorless synthetic diamonds," Spring 1997 *G&G*, pp. 42–53). The 0.00431 ct yellow stone was removed from its mounting for more comprehensive examination with the DiamondView (figure 17). Its cuboctahedral synthetic growth sectors were clearly seen from both the table and pavilion, confirming its HPHT synthetic origin.

Although this could have been an isolated event, it underscores the need for caution when buying melee parcels or mounted pieces from unfamiliar sources. Nevertheless, it is important to note that such stones can be unequivocally identified as lab-grown. Colorless and near-colorless (D–N) unmounted diamonds larger than 0.01 ct can be tested using commercially available testing equipment such as the GIA DiamondCheck. Meanwhile, colored diamonds, smaller stones, and mounted jewelry need to be tested by a reputable gemological laboratory. Increased industry awareness, combined with diamond testing, may deter the spread of undisclosed synthetics, ultimately benefiting both sellers and buyers of polished diamond goods.

Rachel Sheppard, Ulrika D'Haenens-Johansson, Kyaw Soe Moe, Tom Moses, and Wuyi Wang

Large HPHT-Grown Synthetic Diamonds Examined in GIA's Hong Kong Laboratory

Over the last decade, the jewelry industry has seen rapid improvement in the quality of synthetic diamond

Figure 18. These two large synthetic diamonds were produced using HPHT growth methods by the Russian firm New Diamond Technology. The 4.30 ct specimen on the left has D color and SI_1 clarity. On the right is a 5.11 ct sample with K color and I_1 clarity.

grown by the CVD (chemical vapor deposition) method. Colorless and near-colorless CVD synthetics with sizes up to 3.04 ct, with I color and SI_1 clarity, have been reported. GIA's Hong Kong laboratory recently examined two large synthetic diamonds created using the HPHT (high-pressure, high-temperature) method that demonstrated parallel progress in the two growth technologies. These samples, shown in figure 18, were produced in Russia by New Diamond Technology.

The first was a 4.30 ct cushion shape with D color and a clarity grade of SI_1, based on three small clusters of metallic inclusions. The other was a 5.11 ct cut-cornered rectangular modified brilliant. It had K color and a clarity grade of I_1, the result of a few metallic inclusions and two small fractures in the girdle area. Neither one showed reaction to long-wave UV radiation. When they were exposed to short-wave UV, a medium to strong green-yellow fluorescence was observed. Both showed strong yellow-green phosphorescence lasting more than 20 seconds. One noteworthy feature was the absence of pinpoint inclusions, which are common in HPHT synthetic diamonds and often distributed throughout the crystal.

Absorption spectra in the infrared region demonstrated these were type II diamonds, with no absorption band detected in the one-phonon region (approximately 1350–1000 cm^{-1}) where nitrogen impurities occur. A very weak 2800 cm^{-1} band was attributed to trace substitutional boron. A higher boron concentration was recorded in the D-color synthetic diamond (7 ± 1 ppb, compared to 1.2 ± 0.2 ppb). Photoluminescence spectra collected at liquid-nitrogen temperature with varying laser excitations revealed an emission doublet at 736.6/736.9 nm from the silicon-vacancy defect, and an 882.7/884.4 nm doublet from the well-known Ni-related defect. Very weak emissions from nitrogen-vacancy centers at 575.0 and 637.0 nm were detected only in the K-color sample. Besides metallic inclusions, another important identification feature of HPHT synthetics is fluorescence. Typical fluorescence patterns showing multiple-sector growth were observed in both samples.

These two diamonds were disclosed as HPHT synthetic when submitted for examination. Tested using the GIA DiamondCheck device, both were referred for further testing. Gemological observations and spectroscopic features confirmed they were HPHT synthetics.

Examination of these improved HPHT synthetic diamonds, the largest synthetic diamonds produced by any method that GIA has examined so far, demonstrated significant progress in this growth technology. In addition to their use as gem materials, crystals of this size have many potential industrial applications.

Ping Yu Poon, Shun Yan Wong, and Carmen Lo

SYNTHETIC MOISSANITE Melee in a Colored Diamond Bracelet

A colored diamond bracelet submitted to the New York laboratory for identification (figure 19) contained 162 round brilliants ranging from 0.05 to 0.20 ct, with a color range from near-colorless to fancy yellow and brownish yellow. Melee-size dia-

Figure 19. This fancy-color melee diamond bracelet contained two synthetic moissanites.

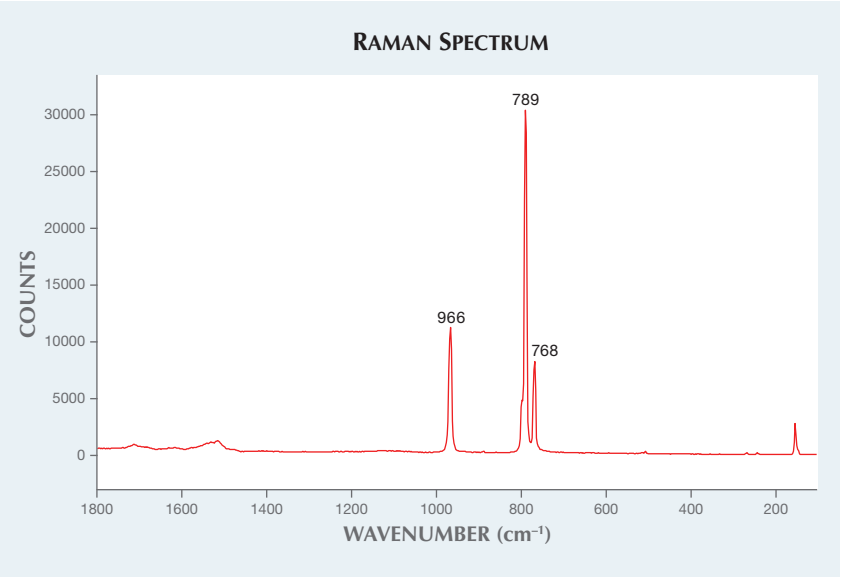


Figure 20. Raman spectroscopy confirmed the identification of two colorless round brilliants as synthetic moissanite with peaks at 768, 789, and 966 cm^{-1}.

monds below 0.20 ct are usually not screened for synthetics and imitations, and melee set into fine jewelry are very seldom tested due to limitations from the mounting. But because of recent concerns over fine diamond jewelry set with melee-size synthetics and imitations (see H. Kitawaki et al., "Identification of melee-size synthetic yellow diamonds in jewelry," Fall 2008 *G&G*, pp. 202–213; Winter 2014 Lab Notes, pp. 293–294), we decided to conduct a full analysis on the mounted round brilliants in this bracelet.

Testing was first performed on the 60 near-colorless round brilliants with the DTC DiamondSure. Several samples were referred and sent for further testing using Raman spectroscopy. Of these, two round brilliants were suspected as imitation. Close examination under the optical microscope revealed obvious doubling on the facet junctions, a key identification feature for synthetic moissanites (K. Nassau et al., "Synthetic moissanite: A new diamond substitute," Winter 1997 *G&G*, pp. 260–275). Further testing with Raman spectroscopy confirmed this identification with three peaks at 768, 789, and 966 cm^{-1} (figure 20).

FTIR spectroscopy performed on the other referred near-colorless and colored melee identified them as natural. One melee was found to be type IaB, while the others were type IaA.

This analysis showed that melee-sized diamond imitations are being mixed with natural diamond parcels and set into fine jewelry without proper disclosure. Therefore, proper identification by a gemological laboratory is an essential tool to maintaining the integrity of the industry.

Jessie Yixin Zhou

PHOTO CREDITS:
Nuttapol Kitdee—1, 11; Jonathan Muyal—2; Jian Xin (Jae) Liao—4, 6, 8, 13, 16 (left); Paul Johnson—9 (left and right); Kyaw Soe Moe—9 (center); Jessie Yixin Zhou—10, 19; Sood Oil (Judy) Chia—12, 19; Robert Weldon—15; Martha Altobelli—17; Ming Yin Poon—18.