GJEPC INDIA

GTL GEM TESTING LABORATORY SINCE 1972

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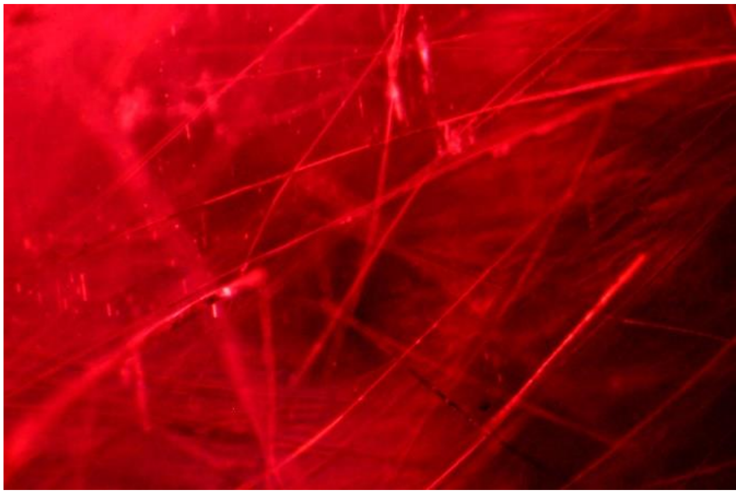
TRANSPARENT GEM-QUALITY RHODONITE

Rhodonite is popularly known as an ornamental gem material with black veins of manganese oxide against a pink body colour. Transparent gem-quality specimens are rarely found, and when found, large sizes are even rarer. Due to the challenges of cutting and polishing, faceted rhodonite is much rarer and qualify as a museum specimen. This is suggested by the fact that a 10.91 ct faceted rhodonite was on display at Toronto's Royal Ontario museum.

1. This 14.50 ct red rhodonite was exceptional for its size and transparency.

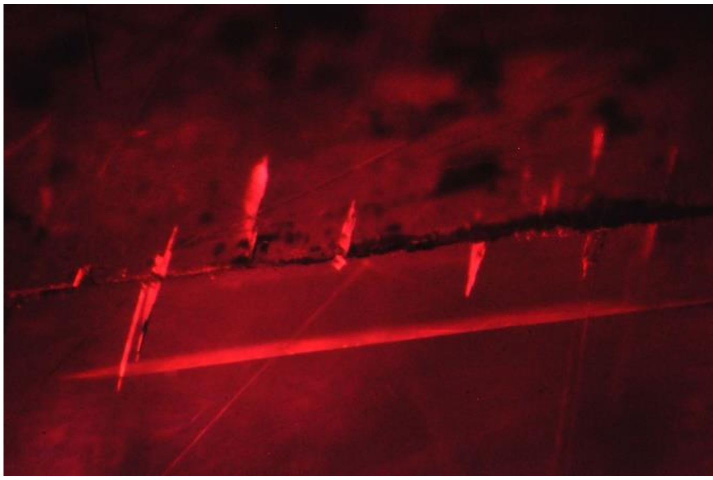
The GJEPC-Gem Testing Laboratory received one bright red to orangy red faceted specimen, weighing 14.50 ct, which turned out to be rhodonite (figure 1). The specimen, on initial observation reminisced spinel, but doubly refractive reaction under polariscope immediately ruled out that possibility. Refractive index was measured at 1.730-1.742 with birefringence of around 0.012, while hydrostatic SG at 3.62; under desk-model spectroscope, broad absorption was seen in green region,



2. The transparent rhodonite specimen contained numerous hollow tubes, filled with epigenetic substance.

centred at ~550nm, and weak features in violet region. The specimen displayed a distinct pleochroism with shades of orangy to yellowish red to red. These gemmological properties are consistent with those reported for rhodonite.

Under microscopic observation, the specimen displayed numerous elongated tubular inclusions, which were randomly oriented. These tubes appeared to be hollow and partially filled with an epigenetic substance (figure 2). In addition, the specimen also displayed incipient cleavage planes (figure 3) in three directions, typically associated with rhodonite, and numerous liquid fingerprints. Identity of the specimen as rhodonite was further established by Raman spectroscopy.



3. Incipient cleavages in the 14.50 ct rhodonite. Visible here are two directions, while the third direction is parallel to plane of viewing.

HETEROSITE-PURPURITE: AN INTERESTING ORNAMENTAL GEM

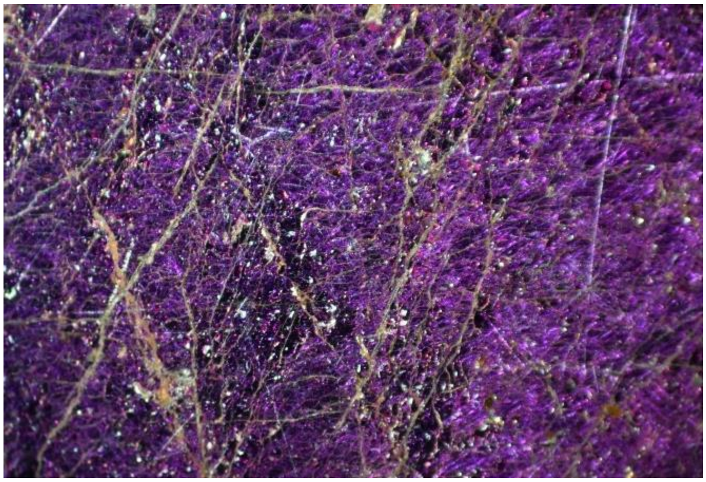
Recently, the GJEPC-GTL received a 44.31 ct (measuring 25.08 x 24.99 x 6.41mm), purple cabochon (figure 4), which was thought to be charoite or sugilite by the owner, because of sample's 'purple' colour. However, the typical wavy streaks associated with charoite was missing, which raised concerns about the identity of this specimen. The submitted purple cabochon rather displayed a sheen effect, similar to that seen on satin fabrics. In laboratory's experience, such sheen effect was never observed in a charoite. This

4. This 44.31 ct cabochon of heterosite-purpurite was striking for its purple colour and appearance.

prompted further gemmological and spectroscopic analyses.

Because of the strong sheen and 'satiny' appearance, the cabochon was immediately observed under the microscope, which revealed fine layered and flaky structure, along with scattered metallic crystals. These layers also displayed iridescent colours under oblique illumination (figure 5). In addition, un-oriented metallic brown veins were also present throughout the sample (figure 6). The flaky and layered structure of the sample appeared to be the cause of sheen or 'satiny' appearance. The overall structural pattern was neither observed in charoite nor sugilite before.

5. The 44.31 ct cabochon of heterosite-purpurite displayed fine layered structure, responsible for strong sheen and iridescence. Black intermittent areas are mineral grains (also heterosite).



6. The heterosite-purpurite cabochon also displayed brown veins throughout the surface, whose Raman features were also consistent with heterosite.

Further gemmological testing revealed refractive index above the range of standard gemmological refractometer, while hydrostatic SG was measured at 3.35. Under desk-model spectroscope, broad-diffused absorptions were seen in violet and green regions; the sample appeared inert under long-wave and short-wave UV light. EDXRF analyses revealed P, Mn and Fe as major elements, while Raman spectroscopy established the identity of this cabochon as heterosite.

Heterosite, $(Fe,Mn)PO_4$, forms an isomorphous series with purpurite, $MnPO_4$, belonging to triphylite group of minerals, and hence, a clear separation between the two species may be challenging without in-depth chemical analyses. The purple cabochon described above however revealed iron (Fe) to manganese (Mn) ratio of 2:1, suggesting that the tested sample belonged to the heterosite end member. Although, heterosite-purpurite, due to its striking colour and appearance is gaining popularity as a healing stone, but majority of gem dealers are unware about this material.✦

GREEN KYANITE, IMITATING EMERALD

GJEPC-GTL received a green faceted stone (figure 7), which on preliminary observation reminisced a low-commercial quality emerald. In addition to exceptional emeralds, such commercial qualities of emeralds are also a common feature at the laboratory. Standard gemmological testing, however, immediately ruled out the possibility of the specimen as emerald. Refractive index was measured at 1.712-1.725, with birefringence of 0.013, hydrostatic SG of 3.61, and distinct pleochroism with greenish blue and green shades; under desk-model spectroscope, it displayed an absorption band in the yellow-green region, commonly associated with V/Cr. Gemmological properties were consistent with those for kyanite.

7. This faceted green kyanite with distinct colour zones, reminisced commercial grade emerald.

Under magnification, the green kyanite specimen displayed reflecting films oriented along planes parallel to lamellar twinning (figure 8). Also present were numerous fissures or tubes along twinning planes, and distinct colour zones / bands. Although, gemmological properties readily identified the specimen as kyanite, Raman spectroscopy further established its identity.

8. Green kyanite displayed numerous reflective films along twinning planes.

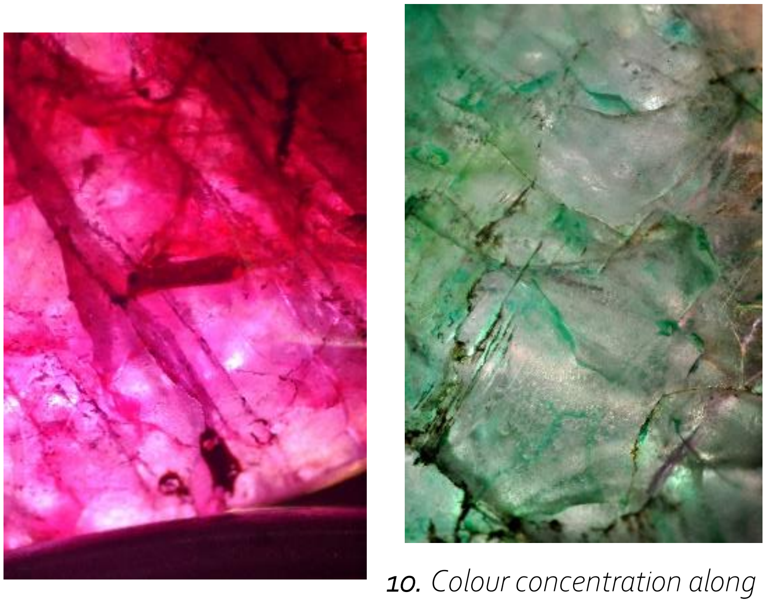
Such reflective films, tubes and colour zones are also commonly seen in commercial grade emeralds; therefore, a casual observation may lead to misidentification. Further, separation of green kyanite from emeralds may prove to be challenging for the trade, which is generally equipped only with a 10x loupe. The separation becomes more difficult when mixed in parcels of emerald.

ZOISITE, DYED TO IMITATE RUBY AND EMERALD

There are numerous reports and instances, when lesser-known dyed materials were presented as well-known gems like ruby, sapphire or emerald; some of the common dyed materials include quartzite, colourless beryl, white corundum, sillimanite (fibrolite), etc. Recently, GJEPC-GTL received two briolettes, in red and green colours (figure 9), which interestingly turned out to be dyed zoisite.

9. These two briolettes, identified as dyed zoisite, were presented as ruby and emerald.

Identification of both the specimens as dyed was not challenging, due to their uneven colouration; colour concentrations along surface fissures were obvious even to the unaided eyes. Under microscope, pale body colour of both the specimens was also visible (figure 10). Refractive index was measured at 1.690-1.700, both specimens displayed uneven fluorescence under long- and short-wave UV light, with reaction under long-wave being stronger; hydrostatic SG was not measured because of presence of dye. RI suggested the specimens to be zoisite, which was later confirmed by Raman spectroscopy.



10. Colour concentration along surface fissures, with pale body colour readily identified these specimens as dyed.

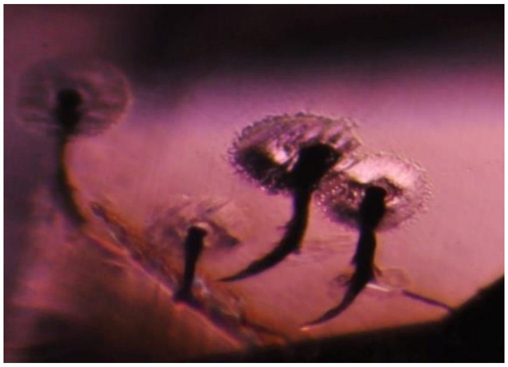
This was first instance, when the laboratory encountered zoisite being dyed and presented as ruby and emerald.

TYPE IIA DIAMOND WITH INTERESTING LASER-DRILLED HOLES

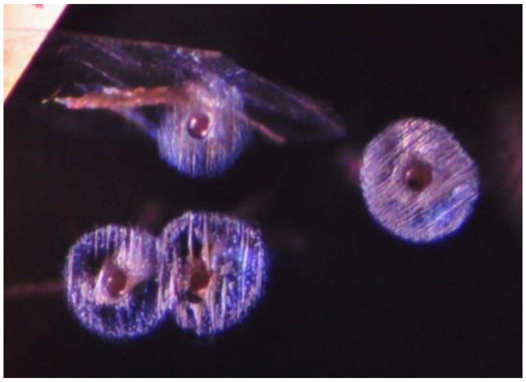
A 2.03 ct pear-shaped rose cut colourless diamond was submitted for identification at the GJEPC-GTL (figure 11). As per standard protocol of multi-step testing procedure being followed at the laboratory, the submitted diamond was identified as Type IIa by infra-red spectroscopy, while DiamondView imaging displayed blue fluorescence with web-like growth lines, typically associated with Type IIa natural diamonds. Further, no Si-V or Ni-related defects were detected in Photoluminescence spectroscopy.

11. *This 2.03 ct rose cut Type IIa diamond was proved to be natural, but clarity enhanced with laser-drilling, followed by glass-filling.*

Under magnification, few tubular inclusions were visible with a bend at one end, while the other end was breaking on the surface (figure 12). Cross-section of these tubular inclusions were circular in shape (figure 13), suggesting that the tubular inclusions were laser-drilled holes and not natural etch tubes. Further, openings of these drilled holes were also associated with a circular area, displaying blue flash / iridescence, along with etching or burnt marks (figure 13). The drilled holes with bends also displayed associated fine fringes emanating from the main hole (again, figure 12), reminiscing legs of varieties of insects.



12. *These laser drilled-holes in the 2.03 ct Type IIa diamond were interesting because of their bending and associated fringes. Also note the etching pattern around opening of these holes.*



13. *Circular cross-section of tubular features suggested that these were laser drilled holes and not natural etch tubes. Also note blue iridescence along etching pattern around opening of drilled holes.*

EDXRF analyses of the drilled holes revealed the presence of lead (Pb), suggesting that they were also filled with lead-based glass.

'RESIN-FILLED' CORUNDUM STRING

Recently, a string containing red to pink and colourless spherical beads was submitted for identification (figure 14). All beads displayed anisotropic reaction under polariscope, while spot RI of ~1.76 and Raman spectroscopy confirmed these beads as corundum i.e., ruby and sapphires. When viewed under the microscope, these beads displayed numerous crystal inclusions, mostly brown, and twinning planes. No features associated with heating were observed.

14. This string containing beads of corundum (ruby and sapphires) was proved to be fissure-filled with resin, by infra-red spectroscopy.

Most of the beads also contained surface-breaking fissures, which displayed an uneven filling; twinning planes also displayed similar uneven filling, with weak iridescence. No flash effect associated with glass- or resin-filling was observed. However, infra-red spectroscopy (in the region 2700-3200cm^{-1}) of randomly selected beads revealed features at ~2872, 2926, 2966, 3035 and 3055 cm^{-1}. These features are consistently seen in other resin-filled gemstones, such as emerald, aquamarine, amazonite, etc.

This example illustrates the application and importance of spectroscopic methods such as infra-red or Raman spectroscopies in gem identification, without which the applied treatment i.e., fissure filling, could have been missed out!

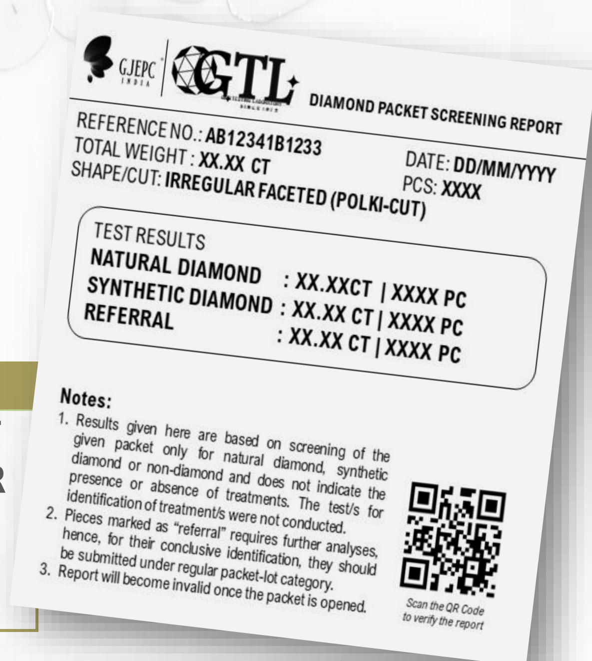
GJEPC-GTL INTRODUCES **LOW-COST SCREENING** OF **'STAR & MELEE-SIZED'** AND **'POLKI-CUT'** DIAMOND PACKETS

Adding to the bouquet of services for the gem & jewellery trade, the GJEPC-GTL has now introduced low-cost screening of 'star & melee-sized' and 'polki-cut' diamond packets, enabling jewellers to filter out possible mixing of synthetic (lab-grown) diamonds from the manufacturing pipeline.

State-of-the-art instrument like Automated Melee Screening (AMS-2) is used for screening 'star & melee-sized' diamonds, while SynthDetect XL is used for screening of 'polki-cut' packets. Both these screening instruments, developed by DeBeers Group, are very well acknowledged by the diamond experts and the trade, worldwide.

In case of 'polki-cut' diamond packets, any shape and size of polkis in the colour range D-Z can be screened, while in 'star & melee-sized' packets, all common shapes in the colour range D-Z and sizes in the range 0.003 ct (0.90 mm) to 0.20 ct (3.80 mm) can be screened. The screened diamonds are separated as 'natural', 'synthetic' and 'referral', which are returned to the client in a tamper-proof sealed bag. Typically, report indicating screening results are pasted on this tamper-proof sealed bag. Diamonds separated as 'referrals' can further by tested and identified under standard packet-lot category, being offered by the laboratory.

Under this screening service, diamonds are only tested for natural, synthetic, or non-diamond; presence or absence of treatments are not indicted in the results. For identification of possible treatments, diamonds may be submitted under standard packet-lot category.


GJEPC INDIA | GTL DIAMOND PACKET SCREENING REPORT

REFERENCE NO.: AB12341B1233
DATE: DD/MM/YYYY
TOTAL WEIGHT : XX.XX CT
PCS: XXXX
SHAPE/CUT: IRREGULAR FACETED (POLKI-CUT)

TEST RESULTS
NATURAL DIAMOND : XX.XXCT | XXXX PC
SYNTHETIC DIAMOND : XX.XX CT | XXXX PC
REFERRAL : XX.XX CT | XXXX PC

Notes:
1. Results given here are based on screening of the given packet only for natural diamond, synthetic diamond or non-diamond and does not indicate the presence or absence of treatments. The test/s for identification of treatment/s were not conducted.
2. Pieces marked as "referral" requires further analyses, hence, for their conclusive identification, they should be submitted under regular packet-lot category.
3. Report will become invalid once the packet is opened.

Scan the QR Code to verify the report

CERTIFICATION CHARGES FOR DIAMOND SCREENING		
	FEE (IN RS.) PER CARAT + GST	
	MEMBER	NON-MEMBER
STAR & MELEE-SIZE (minimum chargeable: 10ct)	150	200
POLKI-CUT	300	350

For more information on certification,
call the front office at +91-141-2770995 or 2941470 or +919261018000, or write at gtl@gjepcindia.com

we have relocated!

with world-class infrastructure and equipment

- bigger and secured premises of around 10,000 sq ft
- more advanced laboratory with new state-of-the-art equipment
- arrangement of door-to-door pick-up and delivery of samples (at a meagre charge)

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