GJEPC INDIA

GEM TESTING LABORATORY
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# EMERALD - WITH REPAIRED FRACTURE

Fracture filling of emeralds with 'oils' and 'resins' is now widely accepted in the trade, provided both are labelled and disclosed in clear terms. And, the Gem Testing Laboratory has played an important role in separating and labelling these two products in past few years. However, during these years, we at the laboratory have come across many emeralds, in which chipped off or broken pieces were stuck back to the main piece with glue, such as araldite. Since emerald is brittle in nature, during cutting and polishing procedures, some fractures may open up completely and chip off from rest of the stone. Such chipped off pieces are carefully stuck back with glue to the rest of the stone, which may be followed by repolishing to remove any signs of unevenness of the planes. However, such chippings or breakage can also occur as a result of mishandling.

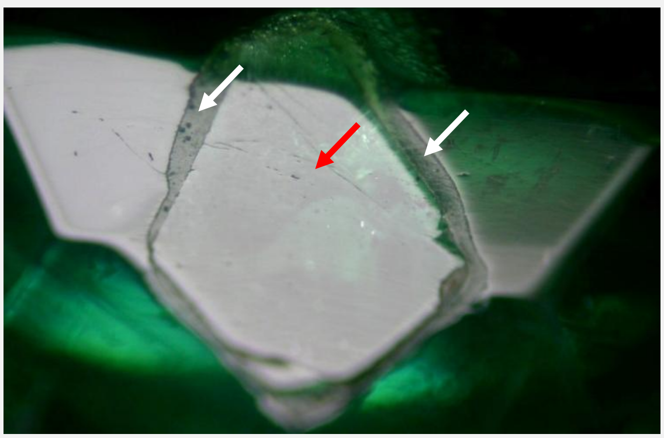


*Figure 1: A typical example, where a chipped off piece (red arrow) has been stuck back with glue (white arrows). Note the difference in lustre of emerald portions and the glue.*

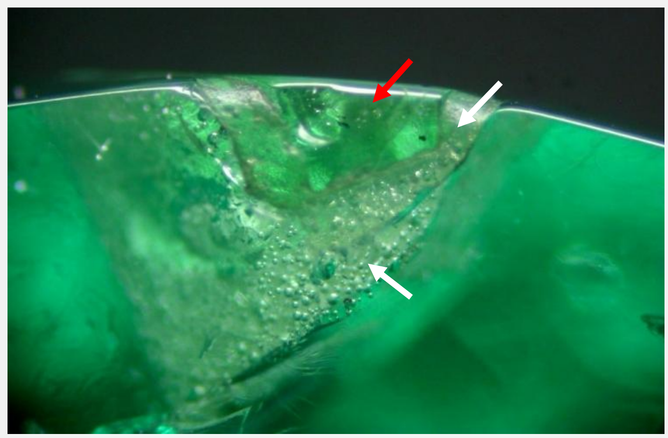
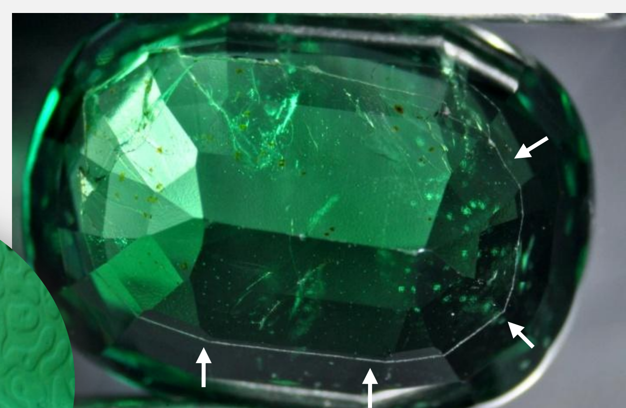


*Figure 2: The suspending 'chipped off' piece (red arrow) is attached to the rest of the stone with help of the glue (white arrows. Also note the trapped gas bubbles in glue.*

Such cases are clearly mentioned on GTL identification reports under comments section. In addition to the information about the identification and quantity of filler, this modification is reported as, "Repaired fracture seen, where chipped off piece has been stuck back".

In some cases, the broken part is so much significant that the 'fixed' specimen can be considered composite. The specimen illustrated in figure 3 was recently encountered at the laboratory which was proved to be joined together; the specimen was split along a 'parting' or 'cleavage' plane lying on pavilion, in the ratio of almost 70:30.

Such specimens show distinct junction plane along with flattened gas bubbles and flow patterns of glue, as seen in 'classical' composite stones, which make their identification simpler. This specimen was identified as 'Composite Emerald' on our report.



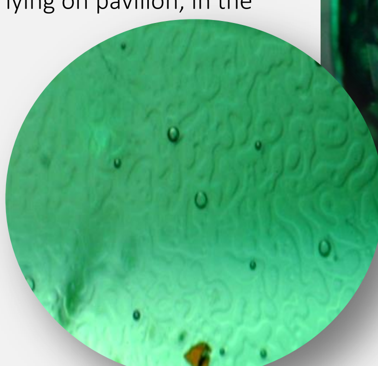
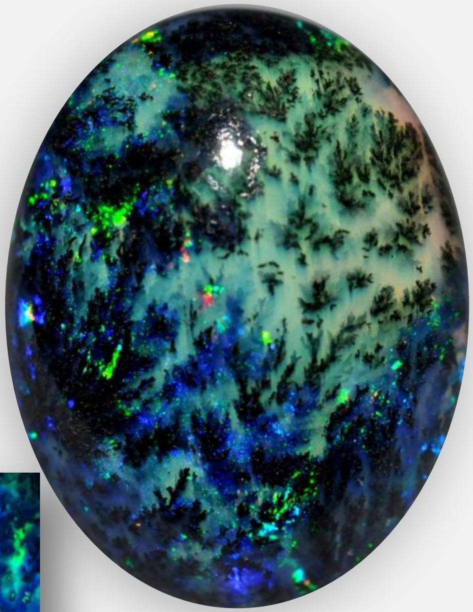


*Figure 3: This emerald was identified as composite because the 'fixed' chipped off part was significantly large (above). Also note the flattened gas bubbles and flow pattern of glue along the junction plane (left).*

# DENDRITIC OPAL WITH PLAY-OF-COLOUR



Opal is known for its brilliant colour flashes on the surface which is widely known as play-of-colour effect and the opal thus considered as 'precious' opal. However, non-phenomenal or common varieties of opal also exist, some of which are highly priced; one such example is fire opal, especially from Mexico. Another variety of opal is 'dendritic' opal, which is also quite popular in fashion jewellery or as an ornamental gem. Dendritic opal is usually found in white, grey, yellow or brown colours with black dendritic inclusions of manganese oxide.

Recently, we received a 12.88 ct opal measuring 20.10 x 15.91 x 8.14 mm, which not only displayed prominent dendrites but also strong play-of-colour effect, dominated by blue flashes. In addition to the blue, some green and red flashes were also present. The dendrites present were quite dense and were identified as composed of manganese oxide by Raman spectroscopy.

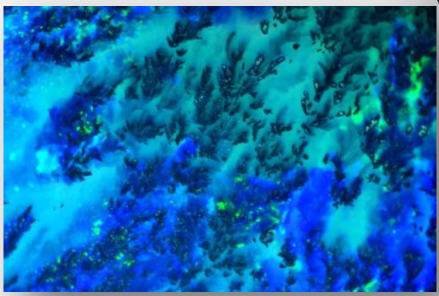


*Figure 4: Dendrites and play-of-colour together in the same specimen makes this 12.88 ct opal quite remarkable. These dendrites were identified as composed of manganese oxide.*

This was the first time we encountered such strong patterns of dendrites and play-of-colour together in the same specimen, which indeed makes this opal remarkable.

# COATED BERYL IN PARCEL OF EMERALD

Coating in gemstones has become very much popular in recent times and is performed on a range of gemstones, from transparent to opaque, from colourless to various fancy colours, providing a wide range of options for the consumers to choose from. However, often these coated gems are sold undisclosed, and mixed in larger parcels of natural stones. One such case was seen at the Gem Testing Laboratory recently, where few coated specimens were mixed in a parcel of natural emerald. A 12.60 ct small packet containing 13 pieces was submitted for identification, where individual stones weighed from 0.51 to 2.07 ct.

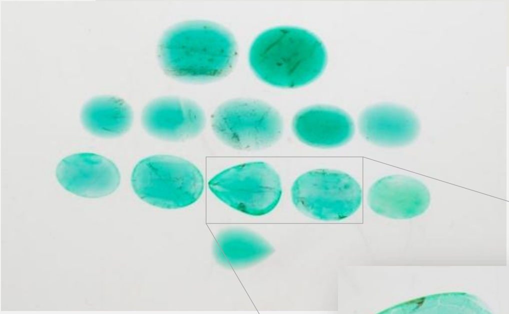
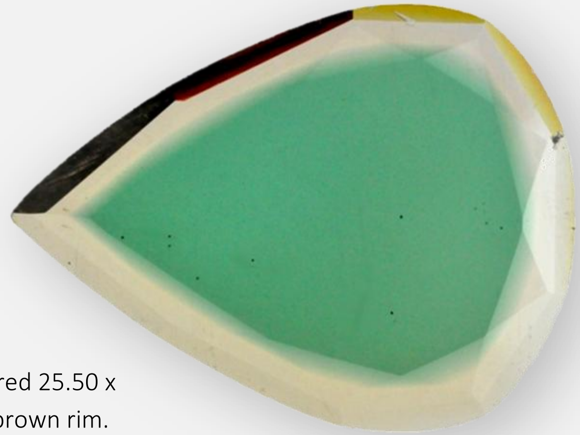


*Figure 5: This packet of emerald contained few coated beryl (third row) and a glass (last row) in top and middle photos. Note the colour distribution confined to facets in coated specimens (right).*

All specimens except one (0.61 ct) displayed RIs and SGs typically associated with emerald / beryl.  The 0.61ct specimen was identified as glass on the basis of gemmological properties. When examined with a microscope, all rest 12 pieces displayed inclusions typically associated with emerald / beryl, but, 5 pieces displayed some unusual colour concentrations confined to the facets. Immersion in bromoform made the visibility of colour distribution quite prominent, confirming surface-related artificial colouration, such as coating.

Although, gemmological examination can readily identify the presence of coated beryl or glass, their presence in larger packets is a concern for the traders.

# A STRONGLY ZONED SYNTHETIC MOISSANITE



Availability of synthetic moissanite in a range of fancy colours such as green, brown, blue, purple, pink, etc has been known in the trade for many years now. The same was discussed in Volume 66 (April 2013) of the Lab Information Circular. However, recently we received a coloured moissanite, which was not only attractive because of its colour and lustre, but also the colour distribution.

The submitted pear shaped faceted specimen (figure 6) weighing 8.29 ct measured 25.50 x 19.39 x 1.98 mm was strongly colour zoned, with green central part and a light brown rim. The effect was reminiscent of a 'parti-coloured' or a 'watermelon' tourmaline. The sample's identification as moissanite was indicated by its gemmological examination. Hydrostatic SG was measured at 3.23, it appeared doubly refractive showing strong doubling effect of facet edges and inclusions, and displayed adamantine lustre with dispersive fire. It typically contained elongated etch tubes with hexagonal profile breaking on the table facet. Further confirmation regarding its identity was established by Raman spectroscopy.

*Figure 6: This 8.29 ct synthetic moissanite displayed unusually strong colour zoning with green centre and brown rim, reminiscing 'parti-colouration'.*

This was first time we have seen such a strongly zoned moissanite, which may even be called 'parti-coloured'.

# DYED LABRADORITE

Dyeing has evolved as one of the most common and widely used gem treatments in the past few years. This is not only perfomed to imitate a well known gem, but also to produce a range of fancy materials. Some of the fancy materials thus produced even do not have a natural counterpart. The most common material used for dyeing is quartz (quartzite) although any material with abundant fractures or pores can be dyed. Recently, we received a dark blue faceted bead weighing 3.73 ct and measuring 9.42 x 9.01 x 5.38 mm which turned out to be a dyed labradorite.

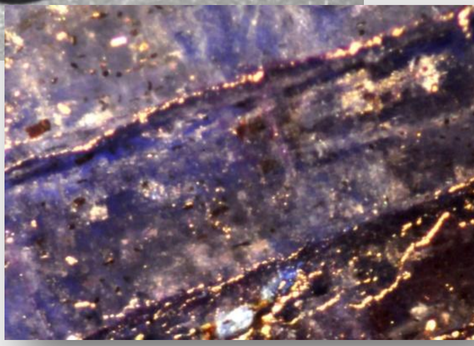


*Figure 7: This 3.73 ct bead was proved to be dyed labradorite. Note the strong blue labradorescence and colour concentrations in fractures (right)*

The bead appeared opaque under standard room lighting but displayed some areas of transparency in strong fibre-optic lamp. Further, while rotating the bead in different direction and observing in reflected light, patches of labradorescence  dominated by blue flashes were visible. The effect of labradorescence was sufficient enough to establish the identity of the bead as labradorite, but few fractures with unusually dark blue colour were quite evident, even with unaided eyes.

Microscopic observations further confirmed the presence of colour patches within the fractures and twinning planes. The bead typically displayed two directions of twinning planes along with oriented black platy crystals. Following gemmological properties were recorded: spot RI - 1.56, hydrostatic SG - 2.62, fluorescence - reddish in shortwave, absorption spectrum - band in red region around 650nm, chelsea filter reaction - red.

Although, we encounter a range of materials dyed in a range of fancy colours, coming across a common gem material like labradorite in dyed version was quite surprising.

## CHROMISM IN SYNTHETIC CVD DIAMOND

Chromism is a reversible change in a substance's colour resulting from a process caused by some form of stimulus affecting their electron density or stablilty. Depending on the source of stimuli, chromism is classified as: *thermochromism* (chromism produced by heat), *photochromism* (produced by light irradiation), *electrochromism* (produced as result of gain or loss of electrons), *solvatochromism* (depends on polarity of solvents) and *cathodochromism* (induced by electron beam irradiation). Out of these, thermochromism and photochromism are the most common ones, and is displayed by a variety of substances.

*Figure 8: This synthetic CVD diamond changes colour from light brown (left) to light grayish blue (right) on exposure to shortwave UV, and regain the original colour on exposure to a filament lamp*

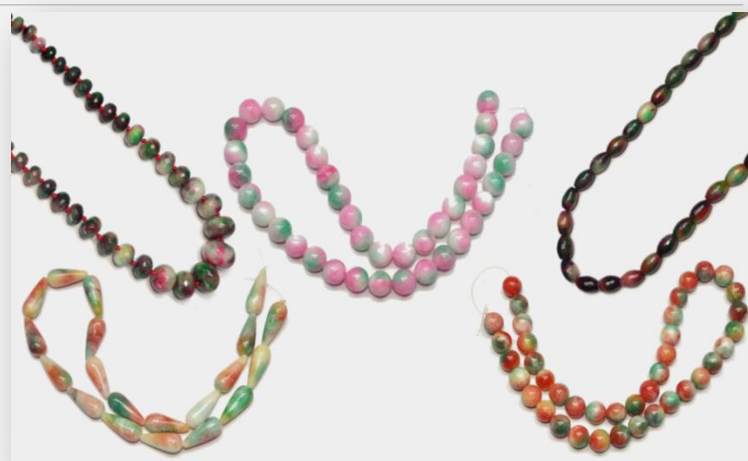
However, recently the effects of photochromism and thermochromism were displayed by a synthetic CVD diamond submitted for identification at the Gem Testing Laboratory. The undisclosed light brown diamond set in earring was submitted for grading report. As per GTL policy every diamond for grading undergoes a thorough identification procedures. This submitted diamond was identified as type IIa on the basis of infra red specta, which prompted us to perform detailed analysis under DiamondView and Photoluminescence spectroscopy.

DiamondView imaging displayed strong green-blue fluorescence with typical striations associated with synthetic CVD diamonds, as seen before in many such diamonds; also present was strong bluish phosphorescence. However, when the diamond was removed from DiamondView, it exhibited a light grayish blue colour instead of light brown - the process defined as photochromism. Since, we had some experience in the past regarding such effects, we placed the diamond under a 60W filament lamp (bulb) and within few seconds, the diamond retained its original colour i.e. light brown - the process defined as thermochromism.

In addition to the DiamondView reactions, synthetic origin of this diamond was further confirmed by photoluminescence spectroscopy, where the characteristic Si-V peak at ~737nm was readily observed even at the room temperature. Although, we have seen such effects in quite a few gem materials in the past including a natural pink diamond, its presence in a synthetic CVD diamond was quite interesting.

## MULTICOLOUR DYED QUARTZ

Quartz or quartzite dyed in blue, green or red colours to imitate well-known gems has been known in the trade for few decades. However, in the past few months we have been receiving this commonly dyed material in a range of fancy multicolours, such as those illustrated in the image on the right. This clearly illustrates that innovation is the key to lure the consumers by providing them something fresh at a reasonable price. It is also interestng to note that the same specimen can be dyed using two or more colouring agents without overwhelming each other.



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