GJEPC INDIA

GEM TESTING LABORATORY

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LAB INFORMATION CIRCULAR

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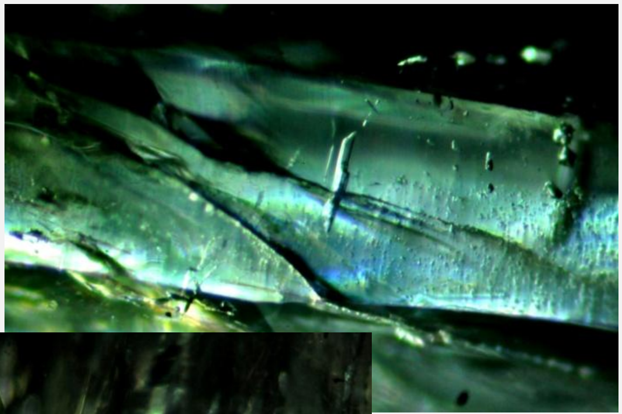
RESIN - FILLED TOURMALINE

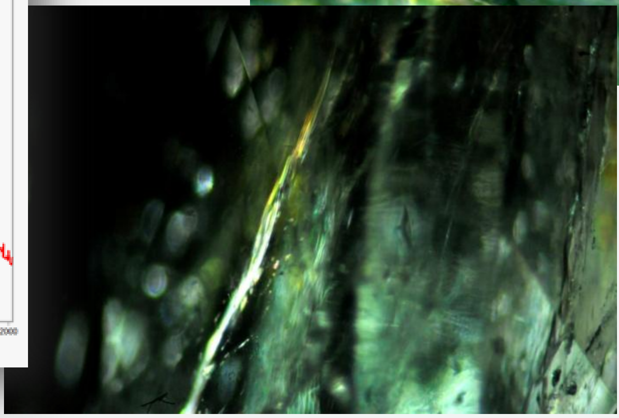
Although, resin filling in tourmaline has been known for more than two decades, these were seldom seen in the trade and hence, the gem laboratories. However, since early 2014, advertisements offering resin-filling services in 'Paraíba' tourmalines have been published in local trade journals along with their promotions during the gem shows. Further, the treater when contacted, informed that many gem dealers (without disclosing their names) from Jaipur are using the facility. We, at the Gem Testing Laboratory, Jaipur have seen such treated tourmalines for the first time in May 2015. This suggests that many of the treated tourmalines have already been sold undisclosed, which is a matter of concern.

The submitted 8.02 ct pear mixed, yellowish green sample measured 20.09 x 10.84 x 5.83 mm, while 5.62 ct cushion mixed, bluish green sample measured 11.87 x 9.46 x 5.90 mm. Their colour was typically associated with copper and manganese-bearing 'paraíba' tourmalines. Standard gemmological properties confirmed them as tourmaline. Qualitative EDXRF analysis revealed the presence of copper as well as manganese; however, the exact origin could not be confirmed, as similar copper and manganese-bearing tourmalines also originate from Nigeria and Mozambique.

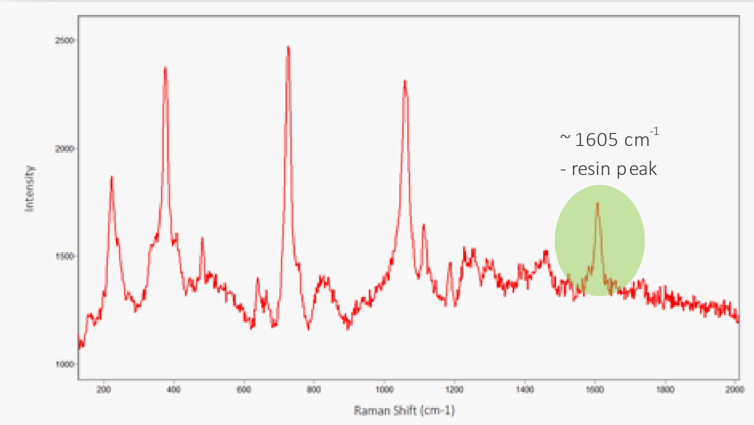
1. These two copper and manganese-bearing tourmalines were identified to be filled with resin.

Microscopic observations revealed liquid films and tubes, 'trichites', along with few fractures. Due to our tendency of checking every stone for filler, these tourmalines when analysed with the same set criteria, displayed some golden and blue coloured flashes at an angle. Although, the flash-effect was not as strong as seen in emeralds, but sufficient enough to warrant detailed infra-red and Raman analyses. Because of the complex molecular structure of tourmalines and the associated absorption features, infra-red spectroscopy did not prove to be useful for identifying fracture-filling in tourmalines. However, by carefully orienting the fracture and focussing the laser on filled areas, Raman spectra conclusively identified the presence of resin, which was clearly mentioned on the issued reports.





2. Weak blue (top) and golden (left) colour flashes were visible in surface breaking fractures of both the specimens.



3. Raman spectra confirmed the presence of resin in these tourmalines.

FOSSILISED DINOSAUR BONE

Also known as 'agatised dinosaur bone' or simply 'dino bone' is the bone from dinosaurs in which the cellular structure has been replaced with cryptocrystalline quartz (chalcedony), leaving the bone structure intact. This results in higher hardness, which takes the polish, as an agate, giving bright lustre. In addition to quartz, other minerals such as opal, calcite, hematite, and pyrite can also act as fossilising agents.

Fossilised dinosaur bone is usually found in brown to black colours with dark brown, red or yellow patches, depending on other impurities present.

4. This 16.51 ct, fancy cabochon was identified as 'fossilised dinosaur bone'.

5. A typical 'cellular' or 'haversian canal' system was seen in this specimen of fossilised dinosaur bone.

Recently, a 16.51 ct, predominantly brown specimen of fossilised dinosaur bone was seen at the laboratory, whose identity was established mainly on the basis of its characteristic cellular structure or 'haversian canal' system, typically associated with bones. While EDXRF analysis supported the identification, revealing presence of Si, P, Ca, Fe and Sr, it's RI and SG was consistent with chalcedonies.

BANDED SERPENTINE

6. This 45.25 ct banded serpentine is composed of green antigorite and pale yellow chrysotile. Also note the sheen effect in chrysotile portion, caused by parallel fibrous structure.

Serpentine is a common ornamental stone that is sometimes used as an imitation of jadeite and nephrite because of its similar aggregate structure and colour appearance. It is usually seen in variable hues of blue, green, brown and yellow, and comprises species such as antigorite, chrysotile, and lizardite, and varieties such as bowenite, williamsite, and ricolite. The two most common species of the serpentine group - antigorite and chrysotile can be differentiated on the basis of their structures. Antigorite usually represents the more solid forms, while chrysotile represents fibrous form, such as asbestos.

In the recent few months, we have seen few specimens of banded serpentines, which were composed of antigorite as well as chrysotile. These specimens were primarily of dark green body colour, with pale yellow banding, displaying strong sheen. The green areas also included tiny black crystals of magnetite - chromite along with cloudy patches typically seen in gem-quality serpentines; the pale yellow areas were composed of fine fibres oriented in one direction, which gave rise to the sheen effect.

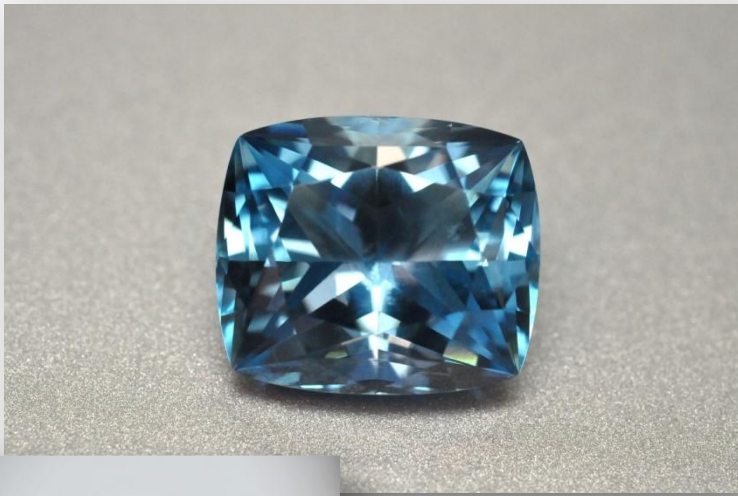
Although, on the basis of appearance, both areas initially thought to be different minerals, but Raman spectroscopy confirmed these two portions as serpentine - antigorite and chrysotile. Further, this combination of antigorite and chrysotile has been reported to be found in South Africa.

A REMARKABLE AQUAMARINE

Recently, Mr. Rajiv Jain of Sambhav Gems Ltd showed us a faceted specimen of aquamarine which was unusual for its size, deep blue colour, clarity, as well as the dichroism. The transparent 22.10 ct, grayish blue, cushion mixed aquamarine (18.81 x 16.17 x 12.13 mm) appeared clean to the unaided eye, while only a small feather was visible under 10x -loupe. Identification of beryl was established through specimen's gemmological properties.

Because of the stone's deep blue colour, initially it was thought to be 'Maxixe-type' beryl, but soon proved otherwise, on the basis of its dichroic colours. The stone displayed deep blue and pale bluish green colours. The deep saturated blue resembled that of a top-quality sapphire. Such strong dichroism is also seen in Maxixe-type (irradiated) beryls, although their dichroic colours are usually deep blue and colourless. The deep saturated blue was seen along the e-ray, and the pale bluish green along the o-ray. Such a pattern of colour absorption is associated with aquamarine; the opposite effect occurs in Maxixe beryl, which appears colourless along the e-ray and deep blue along the o-ray.

Further, polarized absorption spectra revealed an absorption peak at approximately 427 nm along the o- and e-rays, a typical feature in aquamarine due to the presence of ferric iron.



7. This 22.10 ct aquamarine was remarkable for its large size, clarity and deep colour, along with strong dichroism.

8. The aquamarine displayed intense dichroism, with a deep saturated blue along the e-ray (top) and a pale bluish green along the o-ray (right).

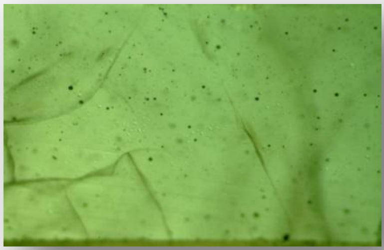
'NEON' GREEN SYNTHETIC SAPPHIRE

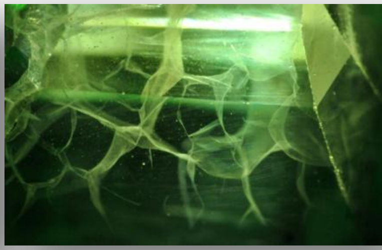
Recently, a 12.35 ct (12.01 x 11.38 x 8.19 mm) bright 'neon' green gem was submitted for identification. RI, SG and inclusions readily identified the sample as synthetic sapphire; under desk-model spectroscope a strong band was visible in the red region. Under magnification, the specimen displayed a 'checker-board' effect, typically associated with crackling; some flux was also present in the cracks. In addition, scattered gas bubbles were present throughout the stone.

This sapphire warrants a description because of its striking 'neon' green colour, which appeared to be caused due to cobalt impurity. Polarized UV-Vis-NIR spectra revealed absorption bands at ~ 450 and 650 nm, along with weak features at ~ 362 and 691 nm; feature at 691 nm was sharper along o-ray as compared to the e-ray. These absorption features are mainly attributed at Co^{3+} impurity.

Although, we have seen many synthetic green sapphires in the past, but this specimen was unusual for its bright green colour, which may also be used to imitate copper-bearing 'paraíba' tourmaline.

9. This 12.35 ct synthetic sapphire was unusual for its striking 'neon' green colour, coloured by Co^{3+}.





10. Scattered gas bubbles (left) and 'checker-board' pattern (right) caused due to crackling identified the sapphire as synthetic.

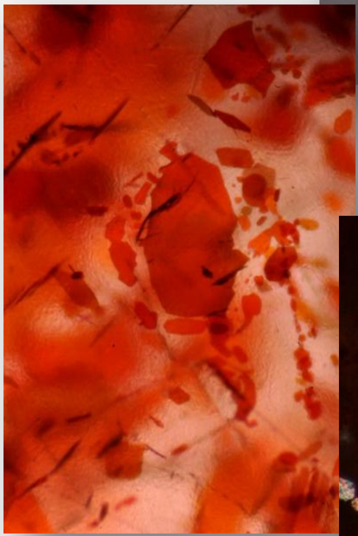
AVENTURINE ORTHOCLASE FELDSPAR

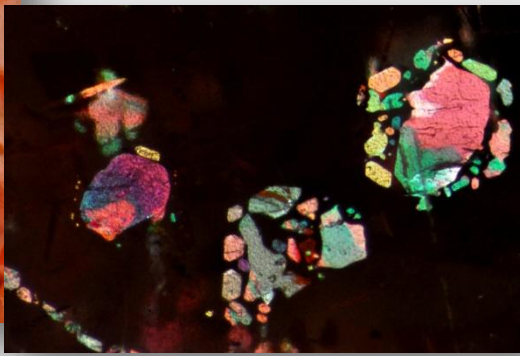
The feldspar group is divided into two main types depending on the composition- potassium feldspars (including orthoclase, microcline and sanidine) and the plagioclase feldspars (including albite, oligoclase, andesine, labradorite, bytownite and anorthite). These two groups can be identified on the basis of composition, structures, and their RIs and SGs.

11. Aventurine orthoclase feldspar

Aventurine feldspar is widely known as 'sunstone', the variety of oligoclase species of the plagioclase series. Along with oligoclase, the term 'sunstone' is also used for the aventurine variety of labradorite. However, recently we received few samples of aventurine feldspar, which appeared to be 'sunstone', but turned out to be orthoclase.

The submitted samples displayed distinct aventurine effect, caused by brownish orange inclusions of hematite; the characteristic effect readily identified the stones as feldspar. However, EDXRF analysis revealed the presence of potassium - the component not found in sunstone feldspar. Therefore, on the basis of potassium, RI and SG, these aventurine samples were identified as orthoclase and not 'sunstone'.





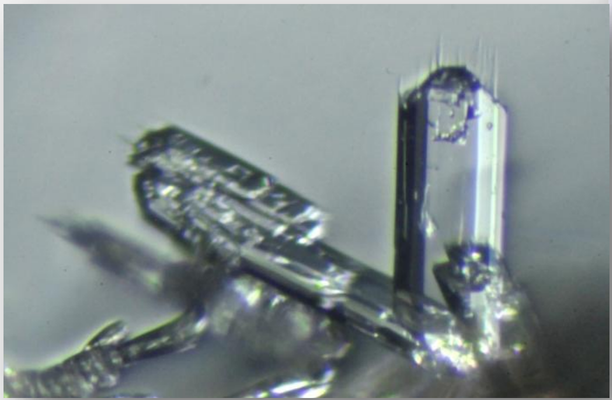
12. 'Skeletal' brownish orange hematite platelets (left), which appear iridescent (right) in oblique illumination are responsible for the aventurine effect in feldspars

Identification of these aventurine feldspars as orthoclase would be challenging or almost impossible without chemical analysis.

GLASS WITH CRYSTALLINE INCLUSIONS

Glasses are known to posses gas bubbles and swirl marks, assisting in their identification; occasionally they also contain crystallites formed as a result of partial crystallisation of the melt. Recently, we received a 253.56 gm rough specimen of glass, which contained well-formed crystals, often in clusters. Identity of glass was readily established on the basis of its standard gemmological properties, while Raman analysis along with characteristic crystal habits identified the crystals as wollastonite, a calcium silicate ($CaSiO_3$). Both these elements are components of glass, where the crystals were formed as a result of devitrification i.e. partial crystallisation of the glass melt.

13. The 253.56 gm glass specimen



14. These euhedral, prismatic crystals in glass were identified as wollastonite by Raman spectroscopy

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