

# Navigating Coloured Gemstone Laboratories

Cara Williams FGA, staff gemologist at Stone Group Laboratories and Gem-A ODL tutor, takes an in-depth look at the changing face of gemmological laboratories, describing what to send for testing, what not to send, and those gemstones that need a careful second look.



*Figure 1: Laboratory testing offers scientific evidence on which to base challenging identifications and treatment disclosures. The grading of gems, along with some country of origin calls may be more subjective.*

The role of gemmological laboratories has changed dramatically over the past few decades. Once used largely for diamond grading and important gems, lab reports now routinely accompany diamonds under a quarter carat and coloured stones that are routinely enhanced, such as tanzanite.

Even stones that are typically untreated, such as spinel and opal, are now commonly accompanied by lab reports. While much of this is aimed at the consumer in order to build confidence, some is necessary between trade professionals due to the difficulty in detecting many newer synthetics and treatments when buying.

Greater awareness of gem treatments is increasingly affecting the value of gemstones, as is origin. Rare and soft stones that were once rarely seen, now regularly appear in jewellery. Few gemologists see most of these materials

with sufficient frequency to become adept at their identification. Even an experienced gemologist may be reluctant to make definitive calls with only standard desktop gemmological equipment.

It is an unfortunate circumstance that lab reports, to varying degrees, have become marketing tools. But besides the market effects, there is relevant need for objective facts when buying certain gems at all levels of the market. This has resulted in more laboratories entering the market.

Read on to discover how best to navigate and evaluate labs, and how best to work with them. For this article, a gem lab will be defined as those that specialise in the advanced testing of gemstones and their treatments rather than the grading or valuing of gems or jewellery. While origin will be mentioned where relevant, the focus will be on identification and treatment of coloured gemstones.

## TYPES OF GEMMOLOGICAL LABS

Some labs test everything, while others specialise in diamond grading. Some Hong Kong labs may specialise in jade, while a Bangkok lab may specialise in corundum. If not certain, ask, and make sure the lab has in place the experience and proper equipment to test the item in question.

Jades, opals, and diamonds all require different experience and different equipment, utilising specific ranges of the electromagnetic spectrum. Always confirm the reputation of a lab. While some have well established international reputations, others may be better known within specific segments of the market or geographic regions. Ask for references, ask colleagues, check credentials and experience. All labs can make honest mistakes; most aim for impartiality while some have a reputation for consistently favouring sellers.

## LAB EQUIPMENT

Instruments such as FTIR, Raman and XRF are important for any gemmological lab. Spectrometers that cover ultraviolet and into the near infrared (NIR) are important for determining origin and sophisticated synthetics. There are any number of newer instruments entering the market that are aimed at identifying the latest generation of synthetic diamonds. Jadeite testing requires FTIR at the minimum, but is best complemented with XRF and UV-VIS-NIR spectrometers to detect dye rather than just polymer impregnation.

## LAB SERVICES

Keep lab price lists for reference, confirm current turnaround times, verify that a lab offers the service you need and is equipped for the necessary testing. This may be basic verbal identification, in order to create an accurate appraisal, to



various formats of written reports, which might include a gem's treatment, origin, and even its cut, color and clarity grade.

Some labs will allow you to ask for a preliminary result before deciding on the final report format. This prevents the full cost of a report should initial tests prove the stone to be synthetic or extensively treated. Include detailed instructions with each item to avoid wasting time. Mounted gems may cost more to test than un-set gemstones. They often require more time and can pose some limits to testing. Labs price services by the stone rather than by the piece of jewellery, so a multi-gem bracelet or strand of jade beads can be time consuming to test, and therefore costly. The lab has no way of confirming all items are alike without actually performing at least basic testing on all, and no reputable lab will create a report on stones they have not tested.

**CONSIDERING WHAT TO SEND FOR OUTSIDE TESTING**

Many inexpensive gems are seen with lab reports, the cost of which may exceed their value. To avoid this, be sure to exhaust all tests available before submitting. Gemmological labs frequently see unnecessary submissions, many preventable with basic testing. However, it is not uncommon to hear from frustrated gemmologists who have been unsuccessful in convincing a client that their uncle's ruby is synthetic, even if the curved color banding is easily visible. Deciding the value at which an item merits laboratory testing is for you and the client to agree, but a lab report should not expire like a

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**2: Jades.** The manner of setting may offer clues to the inherent value of jade items, but can also be deliberately misleading. Polymer impregnation is not always accompanied by dyes and definitive treatment identification is elusive without advanced testing. Confirming dye with a spectroscope may be all or part of the story. UV fluorescence may provide evidence of treatment in some lower grade materials.

valuation; the identity and treatment status should not change over time, changes in nomenclature and unstable treatments being noted exceptions.

From a lab's perspective, the stones that are most commonly problematic in terms of misidentification of imitations as well as inaccurate treatment disclosure are sapphire, ruby, jade, and turquoise. Forget the old rules of thumb like 'to good to be true' and 'so ugly it must be natural' — synthetics passing through labs are often convincingly included to a less-trained observer.

**SUGGESTIONS AND WHAT TO LOOK OUT FOR**

**For the Valuer**

Consider stones on which the value depends on factors not easily determined with standard equipment — the origin and lack of treatment in corundum are obvious situations. Many valuations are stored away only to embarrassingly appear years later with incorrect data. It is important to state when a positive identification has been made and when you have made an educated guess.



**3: Rubies.** Country of origin, heat treatment, and the extent and composition of residues/fillers all affect the value of ruby, even if not readily visible. Shown here are an unheated Mogok Burmese ruby, heated Mong Hsu Burmese ruby with residues, lead-glass filled hybrid ruby, heated Madagascar ruby with flux residues, and unheated Mozambique ruby.



4: **Yellow stones.** Penetrating up to 7mm from any surface, beryllium diffusion can affect the colour of an entire stone or just a shallow surface layer. Colour of beryllium diffused yellow sapphire is often a deep golden or greenish yellow, but every shade of yellow has been seen, including pastels. Shown are various shades of both untreated and treated stones. Learning which is actually which treatment category may be surprising.

Labs continue to evolve and serve as a reflection on the market. Effectively used, they can become an important extension of any business's gemmological department.

**For the Retailer**

More valuable gems sourced from non-traditional sources, such as buying from the public, can pose a challenge. Jewellery manufacturers are not necessarily gemmologists, so it is important to closely examine coloured gemstone jewellery, especially corundum and quartz. While you may trust the reputation of your supplier, trust should not be extended to all of their suppliers.

**For Volume Sellers**

Vulnerable gems with difficult to detect treatments such as beryllium diffused corundum, fancy coloured diamonds, turquoise, jade and amber are worth focusing on. Sourcing large volumes of consistent-quality, natural gems is challenging. Compare batches and look for anomalies or suspicious consistency.

**For Dealers**

Look out for any corundum or jade represented as untreated. Spot check these items, randomly sample quartzes — even if you cut from rough. Consider spot checking carefully chosen samples

rather than testing every item, thereby spreading the cost over more than one item. Many labs will offer batch testing that provides a summary of overall results rather than a report on individual stones.

**WHAT NOT TO SEND TO A LAB**

- *Light blue aqua, topaz, synthetic spinel, glass:* with refractometer and Chelsea filter combined, these are readily identified.
- *Synthetic color change sapphire (a.k.a. imitation alexandrite):* aunts and grannies bought tons of these on holiday in the 1960s.
- *Peridot:* peridot naturally resists treatment. Only confirm that it is peridot — an accurate RI along with 10X observation should suffice.
- *Spinel vs garnet:* with spinel prices skyrocketing, it makes sense to know how to separate them from other gems. UV, Chelsea filter, magnets, or spectra — this is an easy one to learn.

- *Lead glass filled ruby or sapphire:* the value is typically less than the cost of testing. Look for large air bubbles, blue flash from inclusions in ruby, surface-reaching glass fillings and unusual colour concentrations in sapphires, along with red CCF reaction from the cobalt. Size alone should alert you. Any recently sold ruby over two carats should be accompanied with a lab report stating the type and possibly the extent of treatment.
- *Check for coatings:* either on the pavilion or all over. Also check for seams indicating assembled stones as new and often creative varieties of doublets and triplets evolve.

**STONES ON WHICH TO FOCUS**

**Amethyst**

The sheer volume of synthetic quartz produced each year continues to make quartz of all colours require vigilance. While much talked about, synthetics grown from twinned seed crystals remain rare. Twinning and natural inclusions are strong indicators of natural amethyst, while unusually large or clean stones should be carefully looked at and possibly sent for lab testing.

**Ruby**

To identify how it is treated, the extent of treatment and possibly origin. Significant changes in price are the result of levels of treatment that are not always

5: **Sapphires.** Detecting heat treatment in corundum is more difficult in practice than in theory, with many stones exhibiting mixed indicators. As the value gap between heated and unheated stones broadens, lab testing makes sense on stones of significant size and quality.



eye-visible. Age is not a good indicator to rely on. For example, a classic 1960s style fishtail mounting was submitted with a green 'jade' centre and surrounded by 'rubies'. The jade was C-jade – polymer impregnated and dyed – and the rubies were filled with lead glass. Neither treatment was known during the period the ring was originally constructed.

#### Blue sapphire

There is little merit in advanced testing of dark blue, magmatic sapphires, even though some may be unheated. An experienced eye can learn to recognise heat halos and dissolved silk, confirming common heat treatment. The presence of silk is not proof of lack of heat treatment, which often is done below the melting point for rutile, but it can be a clue that the stone – depending on size and quality – merits lab testing.

Lack of treatment currently adds a significant value premium, depending on size and quality. If evidence of high heat is observed, the stone could be beryllium diffused. In the case of blue sapphire, this treatment will lighten over-saturated stones. Many of these stones remain under the radar in today's marketplace, but future markets may better account for this.

A fine sapphire of over 10 carats was submitted by a jeweller who had sold it five years previously as a natural Ceylon sapphire, based on the dealer's word. The colour was a vivid violetish blue and all indicators pointed to the origin being Sri Lanka, however advanced testing indicated beryllium diffusion, resulting in a dramatic difference in value. The older method of surface diffusion of blue sapphire has made a quiet comeback in recent years. A surprising number of sapphires submitted in contemporary settings have tested as surface diffused, including stones over five carats and even 6x4mm ovals in a bracelet. While many gemologists may forget to routinely check for this, simple detection by immersion on a white background is still effective.

#### Yellow to orange sapphire

In today's gem market, the beryllium diffusion of yellow to orange-red sapphire is to be presumed, unless you have reliable documentation that it is untreated or only heated. Unheated, heated, and diffused stones all have a different value structure.

#### Paraiba and cuprian tourmaline

A surprising number of those presumed to contain copper do not, even when they have the appearance of cuprian coloration, while others will contain copper without appearing in the expected peacock colors. While there is good reason to argue value should be based on colour rather than unseen chemistry, market forces cannot be ignored. Advanced testing can also confirm if a cuprian tourmaline has been heat treated.

#### Black opaque gems – beyond the limits of the refractometer

These vary widely from black spinel to synthetic moissanite to a variety of synthetic, natural and treated diamonds. There are a discouraging number of synthetic black moissanites seen with lab reports stating they are natural black diamonds. Whether the labs lacked the correct equipment to detect them, were ignorant of their existence, or merely issued reports without testing is left to speculation.

Diamond testers will miss many of these, but moissanite detectors, which work on electrical conductivity rather than thermal inertia, will accurately identify these in most cases. Carbonado diamonds, a natural polycrystalline black diamond, may falsely test as moissanite.

#### Any important gem with surface reaching inclusions

Once considered a treatment applied

only to emerald, oiling has become part of the finishing process for many gems. Clients may be unpleasantly surprised to find that their otherwise-untreated cuprian tourmaline, alexandrite, ruby or sapphire contains resins. Any gemstone with fine, surface-reaching fissures can be treated this way. Once cleaned, such stones can appear of lower clarity. Semi-permanent clarity enhancement is now routinely done to more gems.

#### CONCLUSION

Ideally, a lab report should be easily interpreted by the trade and consumers, however if unclear about any wording, ask the lab for clarification. Some lab reports use simple language, while others disclose by omission, requiring professional interpretation.

Labs continue to evolve and serve as a reflection on the market. Effectively used, they can become an important extension of any business's gemmological department. Accurate gemmological information ensures market confidence and protects all players in the market.

Be prepared for an occasional result of 'undetermined'. Some questions remain unanswerable either due to the limitations of non-destructive testing or because the art of treating stones closely imitates nature in many cases; however the science is always improving. ■

*All images by Bear Williams.*



**6: Quartz.** Artificial colours that test as quartz make for an easy ID, but there is no variety nor shade of colour seen in natural quartz that has not been synthesized, including inexpensive smoky quartz and lemon quartz. More batch testing at the dealer and manufacturer level would increase confidence in the market.