Gem Identification Instructional Tutorial

www.Gemlabtools.com

About this tutorial

First of all we would like to thank you for purchasing from gemlabtools. We hope you find the information as interesting to read as we found creating it. Please note that to fully appreciate these pages we recommend you connect to the internet prior to reading in order to obtain full use of its content and resources.

Contents

Before we start a Bonus Offer!

To Purchase any of the items in this tutorial either individually or as a full gem identification kit like the one pictured below, please click here or visit us online at www.gemlabtools.com.

Click Here for Professional Gem Identification Kits

Gem Identification Basics

Introduction

This guide has been written to provide the reader with an insight of the main gem testing tools and equipment and how they can be used to assist in the identification of gemstones with certain characteristics.

Background

Identifying gemstones is similar to detective work. To make a positive identification it is important to base your decisions on as many clues as possible and every piece of gemology equipment can give us different clues. It is important to understand that to positively identify a gemstone you must be able to use many different pieces of gemology equipment and understand the process and testing procedures to follow when using the equipment.

Some of the language used in this document assumes that the reader has a basic understanding of some aspects of gem identification or would be partaking further reading or educational instruction from a recognised school or association.

This guide is by no means a substitute to gemology instruction or class study and does not claim to be extensive in its purpose. Rather it has been written to provide a basic fundamental knowledge by means of step by step instructions to an intended user of the equipment described.

How to use a Jewellers Loupe

In the right hands, the basic x 10 magnification jeweller's loupe is the single most piece of equipment used in gem identification. The trained and experienced eye can easily distinguish gemstones from one another and between fakes and synthetic stones just by using the magnification to view the characteristics of the stone. However until that experience is gained, most of us will still require other testing equipment to assist us in the identification process. It is important to use loupe at every opportunity to become familiar with the internal and external characteristics of specific stones. Some stones are more prone to certain types of inclusions than others. The internal characteristics and inclusions in a stone can highlight a vast amount of information about the stone. This of course comes with experience and extensive study and continuous practice but the loupe should be the first tool used when looking to determine a stones identity. Look at the stone through the loupe and try to keep a mental record of patterns of the inclusions that may or may not be present in the stone.

Step 1. Hold the loupe with the

Step 2. Bring the loupe about 2 inches away from your eye and hold the stone with gem tweezers or gem prong in your other hand. Bring the gem up to the loupe so you can see the stone.

Step 3. Bring the stone into focus by finely adjusting the distance between the loupe and your eye and the stone in view.

Step 4. Make a mental note or write/draw your findings with regards to inclusions, cut and quality of cut, number of facets, polish and any other details.

The information you see and record using the loupe will become clearer with further reading from reference books, study or from other sources.

How to use a Gemological Refractometer

Before we start please note that there are many tests which can be carried out using the

refractometer. Here we focus on flat-facet testing for the Refractive Index of a gem which is the most common method of testing, or testing a gem from one of its flat surfaces.

Step 1. Open the hood of the refractometer and initiate your light source. Some most refractometers require a separate external light source but we supply a refractometer with a built-in internal light source. You can use two types of light. White light gives a good reading and monochromatic light gives a finer reading but white light is suitable. Turn on or attach your light source.

To purchase a gemological refractometer like the one pictured **click here** or visit us online at www.gemlabtools.com

Step 2. Make sure the small glass window made from high RI glass is clear from dust or dirt but be careful when cleaning as it is easily scratched, especially when you come to place the stone onto it. You can clean the glass window with a piece of soft cloth or tissue. Next you will need to place a drop of RI or index liquid onto the small glass window. The index liquid you use will determine the result so you need to use preferable a liquid with an RI limit lower than the refractometer's capacity and higher than that of the gemstone. Most index liquids are 1.80 or 1.81. We also supply the 1.81 liquid.

Step 3. Once you have your liquid on the glass, ensure your stone that you will be testing is clean. Again use a lint free cloth or soft tissue. Place the stone's flat facet onto the liquid on the window and gently slide the stone into the centre of the window. Take extra care not to scratch the window glass.

Step 4. Close the hood of the refractometer. To take a reading, look through the lense from a distance of about 10inches. You can move your head up and down until you find the outline. If you are having difficulty locating the outline move the stone back and forth a little to help you.

Step 5. Take a reading from the bottom of the green shadow and round it to the nearest thousandth. You can switch to monochromatic light at this stage if you have one to refine the reading even further. Remove your stone a clean the index liquid from the window and the stone. For further reading and to learn more about other diagnostic tests you can perform with this tool we recommend our more in depth tutorial GGI e-book for refractometer testing.

The refractive index of the gemstone tested is 1.42

For a list of refractive index readings for the most common gems:

Click here for Alphabetical Refractive Index List

Click here for Numerical Refractive Index List

How to use a Polariscope

Which Stones can be tested using the Polariscope?

Any gemstone that allows light to pass through or pass through it in part can be tested. These stones can be described as translucent and transparent gems. Transparent gems allow light to pass through them completely without interference and translucent gems allow some light to pass through them. Either way you can check if your stone is either translucent or transparent by shining a torch light through the stone. If at least some of the light can be seen at the other side of the stone then it can be tested using the polariscope.

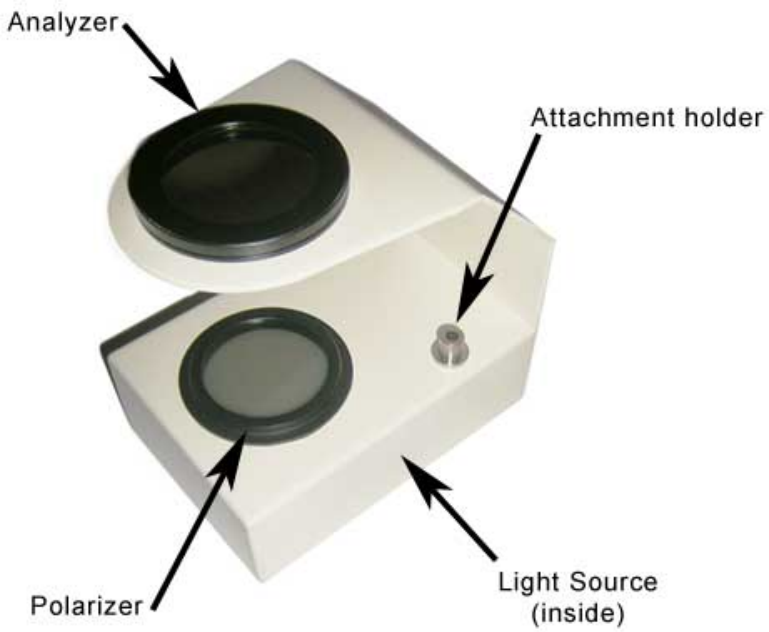
What does a Polariscope test for?

The polariscope can be used to test if a stone is singly refractive (SR), doubly refractive (DR) or an aggregate (AGG).

Knowing whether a stone is SR,DR or AGG narrows the choice of possibilities when identifying a stone.

It can also be used to test a gems optical character i.e, if a gem is uniaxial or biaxial.

Fig.1 Polariscope and its parts



Polarizing filters

A polarizing filter as seen in Fig.1, forces the light to vibrate in a certain direction when the light hits variations on a materials atomic structure, in this case a gemstones surface.

The polariscope has two polarizing filters. The lower filter is fixed and is called the polarizer.

The upper filter can be rotated to different positions and is called the analyzer.

Prior to testing a gemstone with the polariscope one should understand the polarizing filters fixed positions.

Polarizing Filters Fixed positions

Uncrossed Filters

This fixed position is where the analyzer is positioned in a way so that light vibrates in the same direction and so may pass through both the polarizer and analyzer.

Crossed Filters

This fixed position is where the analyzer is positioned in a way so that light vibrates in the opposite direction to that of the polarizer and so may not pass through both filters.

Testing procedure 1

To test whether a stone is either SR,DR or AGG follow the test procedure listed here.

Step 1. Prepare the stone to be tested by wiping it clean and making sure it is transparent or translucent.

Step 2. Turn on the polariscope light and set the analyzer to its darkest crossed position. I.e. so no light can be seen passing through the filters.

Step 3. Place the stone on the polarizer and rotate it a full 360 degrees whilst viewing the stone through the analyzer.

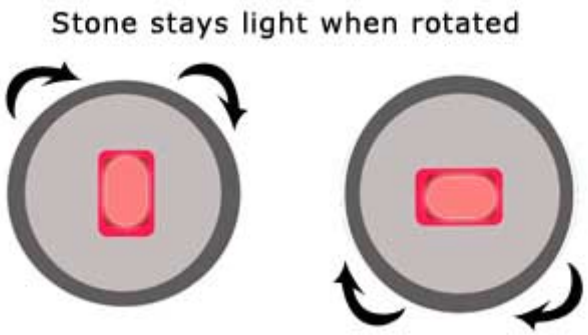
Step 4. Now do exactly the same but turn the stone to a different viewing angle. Repeat the test until you have checked the stone from at least three different angles.

Interpreting your results

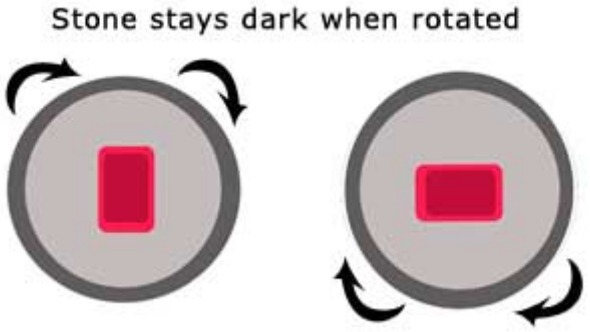
From the tests done you may notice one of the following possible results. Here are things to consider including possible explanations.

When testing a stone you should look for one of three possible reactions when you are rotating the stone:

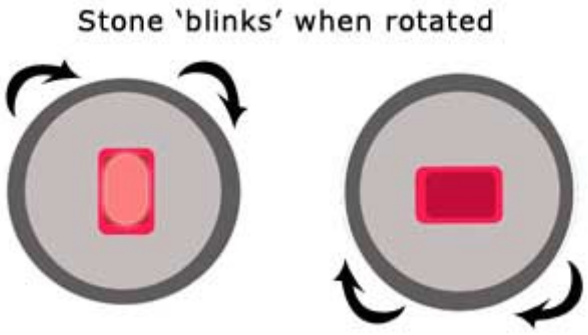
a) The stone may stay light all the time – this usually is because the stone is an AGG however some stones which are actually DR stones or stones with high refractive index may give a false AGG reading in some circumstances. Therefore one should keep this in mind when conducting further testing.



b) The stone may stay dark all the time – if this happens then the stone may be an SR stone or, it may be a DR stone that you are looking at directly along an optic axis. To make sure this isn't the case, make sure you test the stone in at least 3 different viewing angles as described in step 4 of the testing procedure. Once a stone is confirmed as an SR stone the polariscope test is complete and you may proceed to other testing to continue the identification process.



c) The stone ‘blinks’ from light to dark and back to light again – If this is noticed then the test may reveal that the stone is DR, or it may also tell us that the stone is in fact an SR stone that displays *anomalous double refraction* (ADR). If a stone gives an ADR reading it means that the stone looks as if it is doubly refractive but actually isn’t. This may seem confusing at first but a trained gemologist will be used to these identification testing techniques. ADR stones have something called internal strain that occurs during formation. To conclude whether a stone is SR or not you can check with the Dichroscope. This is another piece of equipment available from GEMLABTOOLS.

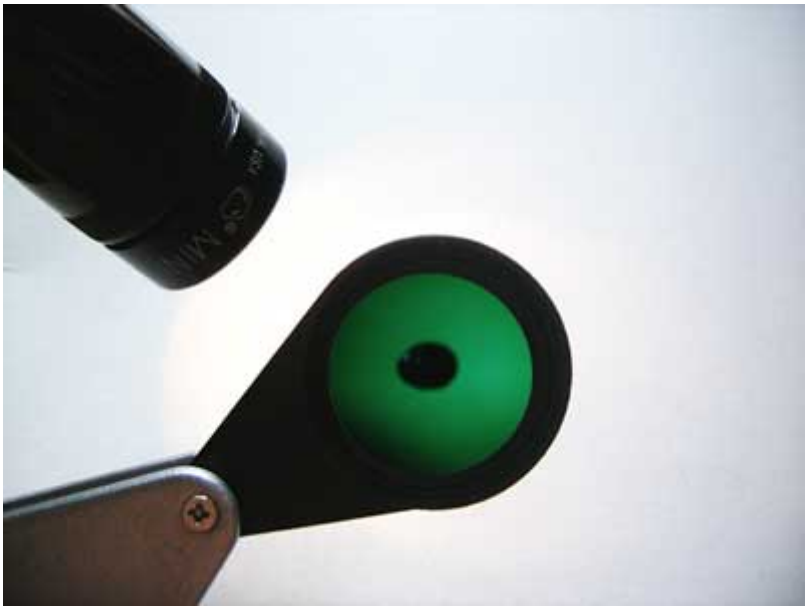


How to use a Chelsea Filter

Step 1. Place your gem on a flat surface. It is better If you can chose a white surface to assist with the light reflection.

Step 2. You will need a good strong light source to aim at the gem so the light can be reflected back from the gem to your Chelsea filter. We do stock a good fibre optic torch that is perfect for viewing gems but if you don't have one then a standard incandescent house bulb may suffice if you can seethe lights reflection through your Chelsea filter.

Step 3. Once you have your light source in position, look at the gem through your Chelsea filter. It is usually better to try and focus the light on the gem to reflect back to your Chelsea filter by holding the filter about 5-6 inches away from your eye.

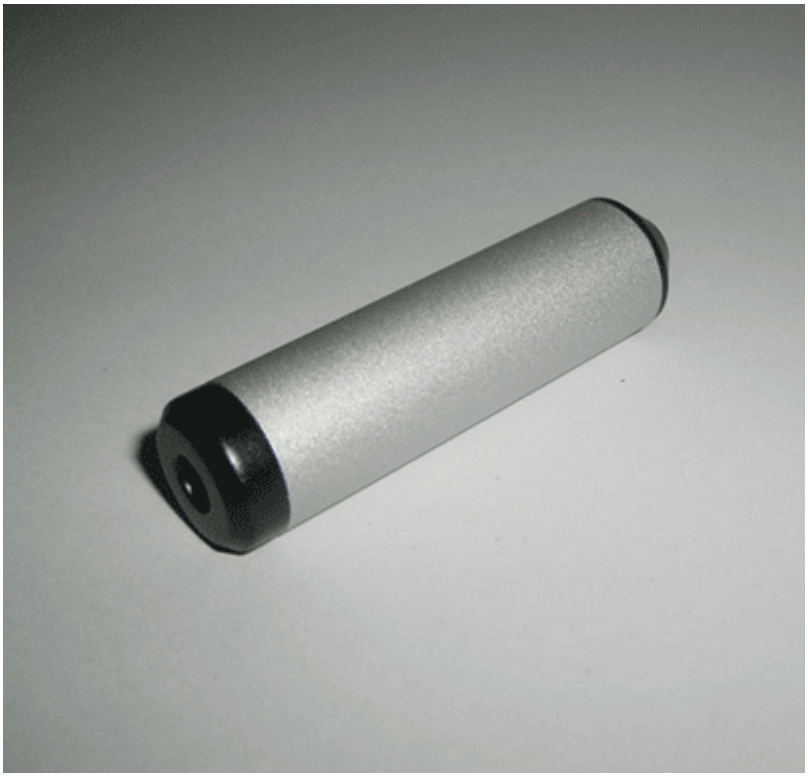


Step 4. You can see that this stone changes colour to black through the filter, which is a common result for Sapphires.

Step 5. I can now continue to identify this stone by conducting further identification checks with other tools. There are many different gemstones which appear to have different colour when viewed through the Chelsea filter and so it can be used to check the properties of many gems. For further reading and the kind of diagnostic tests you can perform with this tool we recommend ……..

How to use a Spectroscope

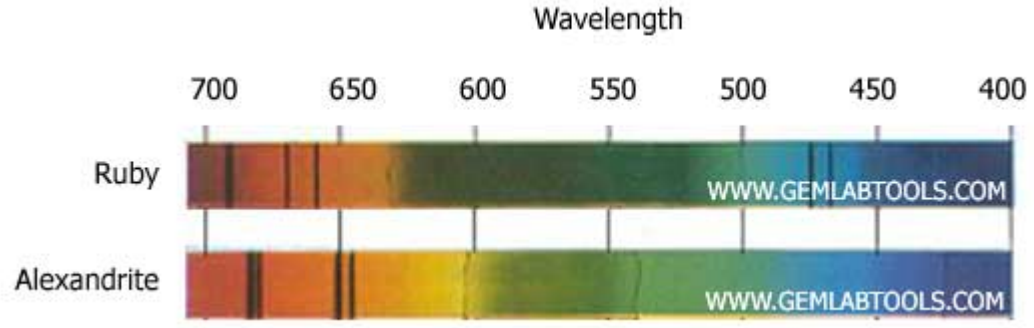
The spectroscope is used to analyze light passing through a stone and splits the white light into its visible spectrum of colours. The light that is absorbed and not reflected back from the stone is displayed within the visible spectrum as a series of black bands running horizontally through the spectrum. Depending on where these bands are located in the spectrum, the gem can be identified.



White light consists of a combination of all the colours of the visible spectrum being - red, orange, yellow, green, blue, indigo, and violet. These are the colours visible when light travels through a prism. When white light is passed though a gemstone, one or more of the wavelengths that produce the colour are absorbed by the gem. The colours that are not absorbed are the colours we see when we look at the stone.

The wavelengths that are absorbed by the stone are seen in the spectroscope as black bands that break the spectrum. Each gemstone species has a unique absorption spectrum. When identifying a stone we look for a spectrum that is characteristic to that stone.

You can see here examples of the absorption spectrums for ruby and alexandrite. Notice the distinct black bands within each of the stones spectrum.



Using a spectroscope requires patience and practice. It takes some time to learn what you are looking for and what the results mean. If you are finding it difficult at first, try using different light sources on different stones. What you actually see through your spectroscope will not be as clear and as easily to tell as to what you see in reference books or charts so practice is the key to mastering this piece of equipment!

There are two kinds of spectroscope. A prism spectroscope is usually larger and contains a series of prisms. These are usually more expensive to manufacture. The cheaper spectroscope is a diffraction type scope which uses etched glass in place of the prisms.

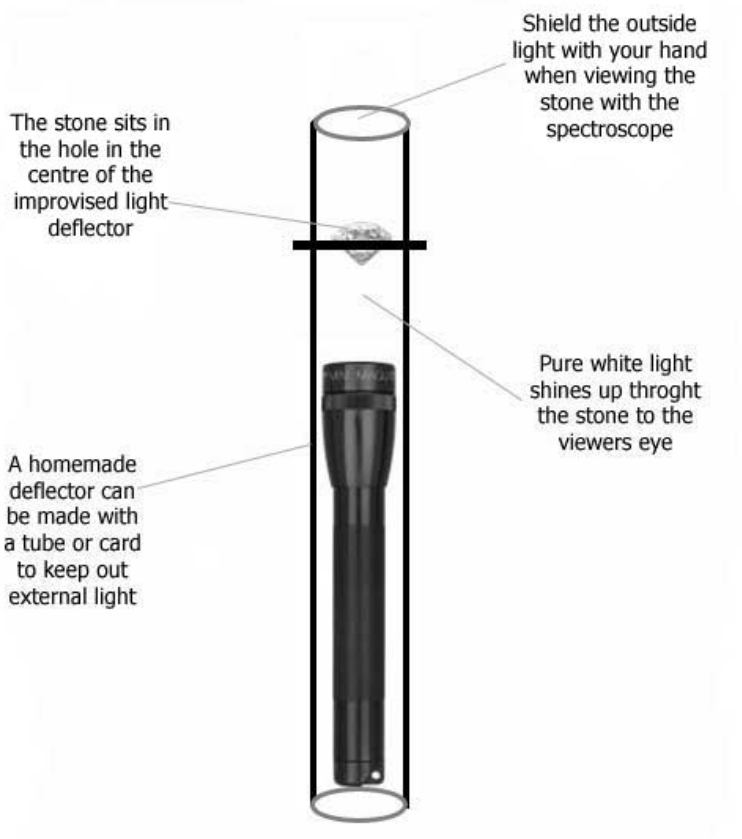
We will focus here on testing using the diffraction spectroscope. You need to ensure you have correct light source. It is important to choose a good light source when using your spectroscope. If you don’t you end up with the absorption

spectrum of the light, and not the stone. To check a light source, simply look through your spectroscope. If you see vertical lines, it's not a good light to use.

The light you use should not be contaminated with any surrounding light as this can disrupt the test result. You may need to make an improvised adaptor at home to ensure any external light is deflected.

I personally use a couple of tubes or card wrapped around to create a tube, placed on a table within which I place the torch light facing upwards. In-between the two tubes I have inserted a platform made again from black cardboard with a small whole cut into the middle.

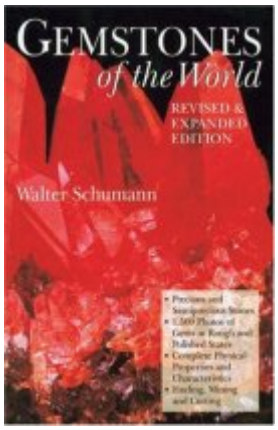
The improvised adapter is held together with tape or glue. Place the stone in the whole so that the light from the torch below shines up through the stone (see diagram below). The spectroscope can then be used to view the stone from the top of the tube without any interfering light. You can compare the spectrum you see to a reference book or chart of gemstone spectrums.



You will need a reference chart or book with the defined spectrums of gemstones to compare your results to. We highly recommend one of the following books available by clicking on the title of interest:

This book contains extensive gem identification charts including refractive index lists and absorption spectrums for many gemstones:

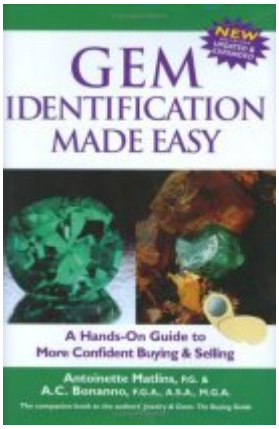
Click on the book cover for a review!



Gemstones of the World: Newly Revised & Expanded Third Edition

By Walter Schumann

Click on the book cover for a review!



Gem Identification Made Easy, Third Edition: A Hands-On Guide to More Confident Buying & Selling

By Antoinette L . Matlins, Antonio C. Bonanno

FOR MORE GEMOLOGY BOOKS AT GEMLABTOOLS CLICK HERE

How to use a Dichroscope

View the stone through the Dichroscope with two to see if there are two distinct colours showing in the squares you see in the dichroscope lenses.

Dichroscope Instructions - Step by Step

Step 1. Hold the viewer of the dichroscope to your eye.

Step 2. Place the gemstone flush to the opening. The hexagonal shape at the end makes it easier to turn the dichroscope during identification.

Step 3. Place the gemstone in the prong holder or gem tweezers into the open space as shown.

Step 4. To identify any pleochroism within the gemstone, look at the gem through the viewer opening, slowly turn the dichroscope exactly 1 full rotation (360 degrees). Whilst you are rotating the dichroscope, pay close attention to any colour differentiation between the two small squares visible inside the dichroscope. The number of different colours you see in the two small boxes in the dichroscopes viewer determines the refractivity and pleochroic properties of the stone. Repeat the rotation a few times to double check the count.

If you do not see colour changes be sure to turn the gemstone to several other angles and repeat the process above. Sometimes the pleochroism only shows on a particular axis of the gem.

Additional Analysis

Advanced Identification The strength of the colours shown is also important to identification. Weak or strong pleochroism plays a role in helping determine the identity of the gemstone.

Take care in choosing your light source, fluorescent light can give a false reading for very weak pleochroism even in stones that do not have pleochroism. You could also use the tabletop polariscope as described earlier in this tutorial, to double check the pleochroism results.

Closing Note

Please note that this tutorial is only a guide to the basic instructional usage of the gem tools mentioned. It is by no means extensive and we recommend that once you are familiar with the basics you should consult other reading materials or study from one of the gemological institutions or associations.

You can find more information and further reading and study guides at our website http://www.gemlabtools.com

To Purchase gem identification equipment click here