



Kirk Feral is a man who is passionate about gemmology but particularly about how to use magnetism to identify gemstones. In a world of high-tech instrumentation, Captain Kirk brings us down to earth.

A Man, A Magnet and an Idea....

GEM IDENTIFICATION WITH MAGNETISM

Every gemstone species and variety shows a characteristic range of responses to the magnetic field of a strong magnet. Every individual gem is either repelled by the magnet (a diamagnetic response), or attracted to the magnet to some measurable degree (a paramagnetic response in most cases).

The response we observe when we apply a magnetic wand to a gem serves as an aid to gem identification. The magnetic response ranges for most types of gemstones are found on the Magnetic Susceptibility Index for Gemstones at gemstonemagnetism.com.

As with other gemology tools, we use a magnetic wand to separate one gem type from another in a process of elimination. Additional testing with other instruments is usually necessary to narrow the possibilities until final identification is achieved. However, in a few instances magnetic testing is all we need to positively identify a gem.

HOW TO MAKE A MAGNETIC WAND

A magnetic wand is made with the strongest permanent magnet available today: an N52 grade magnet containing the rare earth metal neodymium. Neodymium magnets are much stronger than traditional magnets such as horseshoe magnets and refrigerator magnets.

To make your own magnetic wand, begin by ordering a neodymium magnet online. The optimal size and shape is a 1/2" diameter by 1/2" deep cylinder, and the desired strength is grade N52. Important: This exact size and strength is recommended to obtain the maximum degree of response equivalent to responses listed on the Magnetic Susceptibility Index.

For a handle, the magnet can be attached to a metal hex bolt from the hardware store. A good bolt size to fit the magnet is a 2" long bolt with a 1/2" wide head. No glue required!



Finally, to safely store your magnetic wand, use an empty 3" tall pill bottle with a child-safe cap. A piece of gem-jar foam can be placed at the bottom of the pill bottle to buffer the strong magnetic field emitted by the bottom pole of the magnet.

SAFETY PRECAUTIONS

The magnetic wand has a strong pull-force and should be handled with care. Keep it out of the reach of small children. Never put your finger between the magnet and a metal surface or your finger could be injured. During magnetic testing, use only non-metallic surfaces such as glass or wood for your workspace.

Keep your wand away from all electronic devices such as watches, digital gem scales, cell phones, laptop computers and tablets, as these could be damaged. The wand will also erase data stored on credit cards. If you have a pacemaker, never place a magnetic wand near your chest or in your shirt pocket.

TESTING METHODS

Two testing methods are used with a magnetic wand: the Direct Method and the Floatation Method. The 'Direct Method' enables us to make a number of quick and easy gem separations such as distinguishing rubies from red garnets, orange hessonite garnets from orange spessartine garnets, and chrome tourmalines from other green tourmalines. The 'Floatation Method' is useful for separating many types of gems such as aquamarine from blue topaz, iolite from tanzanite, and natural blue spinel from synthetic blue Spinel.

THE DIRECT METHOD

The Direct Method of testing simply involves touching the magnet directly to the surface of a gem while the gem rests on a smooth flat dry surface. We can use this method to first check an unidentified gemstone for magnetism. Direct testing works only with gems that are highly magnetic. Such gems will either drag across the surface, or will be picked up by the magnet.

All Direct responses are affected by the weight of the gem being tested. Large gems that typically show a 'Pick-up' response can at times be too heavy to pick up, but they may drag. When gems are very small and light (under 0.5ct), those which typically show a 'Drag' response may be picked up. The 'Direct' response ranges listed on the Magnetic Susceptibility Index are based on gems of average weight, between one and four carats.

DRAG RESPONSES

Only six common transparent gemstones show a 'Drag' response to a magnet:

1. Peridot
2. Blue Indicolite Tourmaline
3. Green Verdelite Tourmaline
4. Yellow Manganous Tourmaline
5. Mali Garnet (any color)
6. Man-made Pink Cubic Zirconia

The only natural blue gem of any kind that shows a 'Drag' response is indicolite tourmaline, and no other test is needed to positively identify indicolite.

PICK-UP RESPONSES

Only one common transparent gemstone shows a 'Pick-up' response to a magnet: Garnet. If a gem of average size picks up during magnetic testing, you can be sure it is garnet unless you are working with rare stones. Some rare gems such as transparent rhodochrosite and transparent rhodonite also pick up.

The only natural transparent green gem of any kind that picks up is demantoid garnet, and this is the only test needed to positively identify demantoid.

The only common orange transparent gem that picks up is spessartine garnet. A few rare orange transparent gems also pick up, such as triplite and orange rhodochrosite.

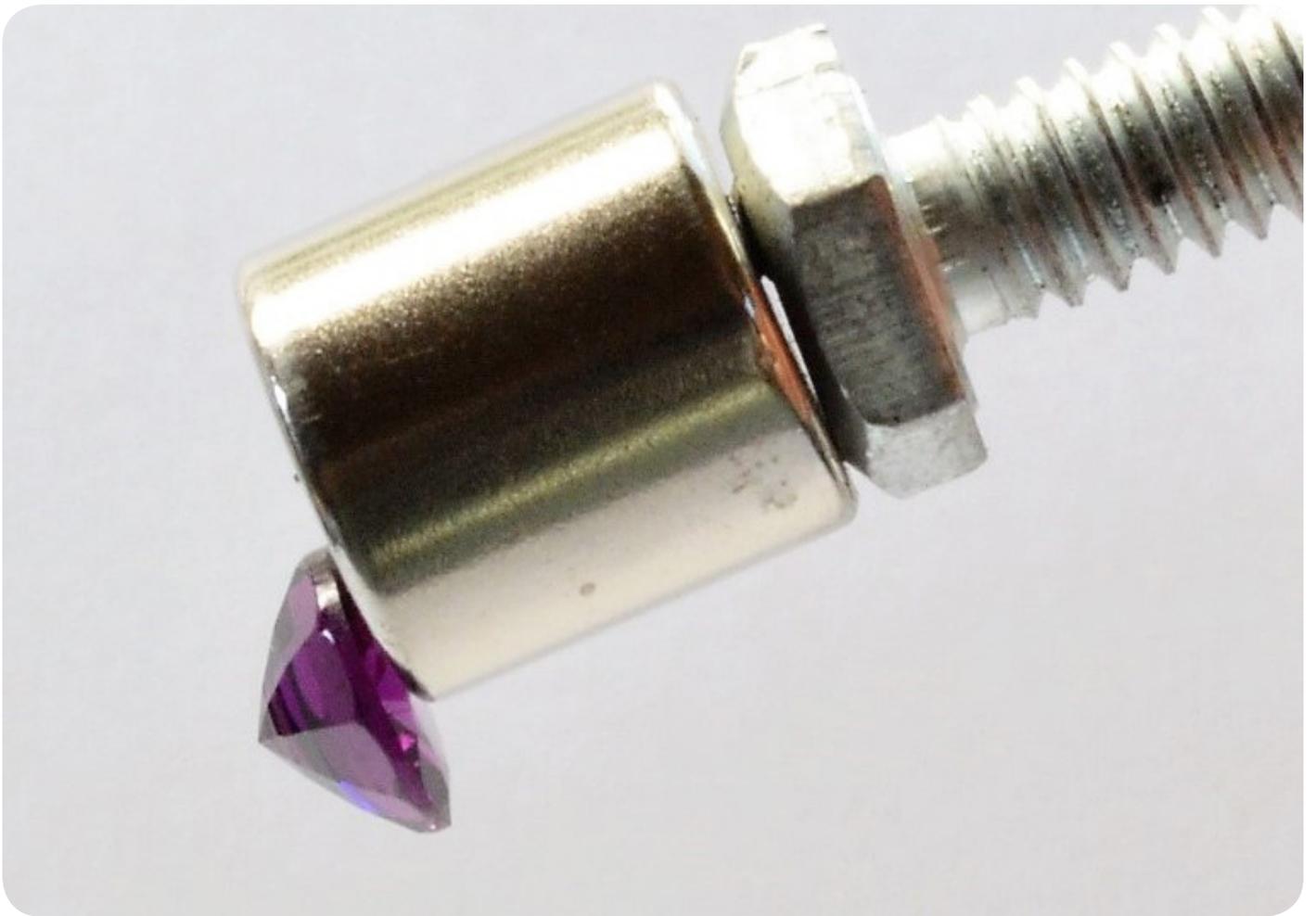
Most garnet gems pick up, but grossular garnets do not. Grossular garnet varieties other than Mali garnet typically show no 'Direct' responses. Mali garnets show only 'Drag' responses. Two unusual varieties of pyrope garnet - chrome pyrope and pastel pyrope - also typically show only 'Drag' responses.

THE FLOATATION METHOD

Because magnetic susceptibility is so low in most transparent gems, direct responses to a magnet are uncommon. In most instances, we must use the 'Floatation Method'. This method allows us to see weak paramagnetic and diamagnetic responses.

Floatation simply involves setting a gem onto a foam raft that floats on water. This method mostly eliminates friction and gravity, two factors that prevent a gem from moving toward or away from a magnet. Unlike the 'Direct Method', the weight of a gem does not affect floatation responses.





Almandine Garnet Picks Up (Photo by Kirk Feral)



Testing a parcel of rubies for garnet substitutions (Photo by Kirk Feral)

HOW TO USE THE FLOATATION METHOD

If a gem is faceted, position the gem face-up, and hold the magnetic wand about a half inch away from the facet table or body of the gem. Maintain the half inch testing distance as the gem and raft are pulled across the surface of the water toward or away from the magnet.

If the raft moves away from the magnet, the gem response is Inert (Diamagnetic). If the raft follows the magnet slowly as you pull the magnet away, you have a 'Weak' response. If the raft glides easily toward the magnet, you have a 'Moderate' response. Rapid movement toward the magnet indicates a 'Strong' response. Deciding which response you are seeing is somewhat subjective. 'Moderate' responses are the trickiest, as these can overlap with either 'Weak' or 'Strong' responses.

MAGNETIC RESPONSES

Direct Method: Drag or Pick-up

Floatation: Inert (Diamagnetic), Weak, Moderate or Strong

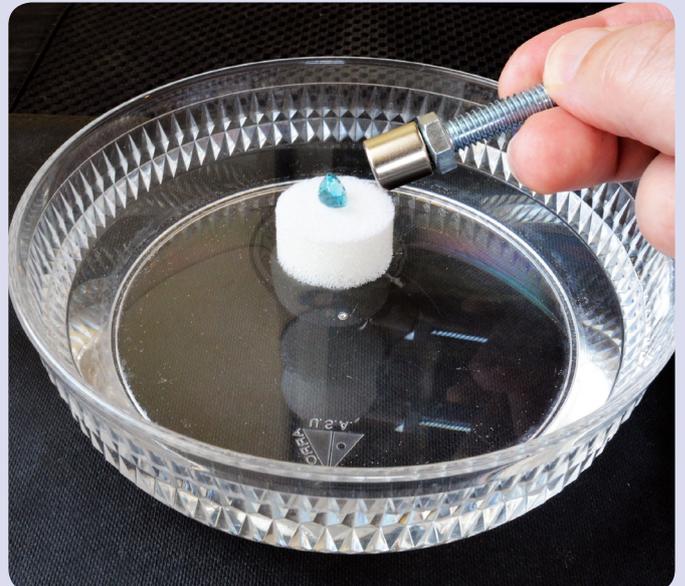
PRACTICAL APPLICATIONS

1. In addition to faceted gems and cabochons, mineral specimens, rough stones and tumbled stones can be tested for magnetic response. A polished facet is not required, and lack of transparency does not affect magnetic testing.
2. Parcels of rough stones or cut stones can be scanned with a magnetic wand to separate stones that show a 'Direct' response. A 'Pick-up' response is particularly useful for quickly separating garnets from all other stones of similar appearance that may be mixed within a parcel.
3. Gems mounted in jewelry can be tested for magnetic response when the 'Floatation Method' is used. Metal settings used in most jewelry are not magnetic and do not interfere with magnetic testing.
4. Gems whose refractive index is too high to be measured on a standard refractometer ($> RI 1.81$) can be tested for magnetic response using a magnetic wand.
5. One of the most important uses of a magnetic wand is separating gems that look alike. Two different gem types that appear identical to the naked eye can often easily be separated by differences in magnetic response.
6. Separating natural gems from synthetic gems is often possible using a magnetic wand. Most other gem identification tools are not suited for this purpose.

To learn more about magnetism in gemstones, visit:
www.gemstonemagnetism.com



The Floatation Method (Photo by Kirk Feral)



Testing Blue Zircon (Photo by Kirk Feral)



Drag response from a Mali Garnet (Photo by Kirk Feral)