How to Perform Mohs Scratch Test

1. Select a Test Surface – The scratch should not be done on a coated, chipped, or weathered surface as this will give inaccurate results. It also should not be done on a visible surface since a bad scratch on the face of a mineral can diminish its value.

2. Make the Swipe – Testing is done by 'swiping' one mineral with the other. The swipe should be strong enough to make a scratch, but not so much as to damage the specimen. Hold the sample and attempt to scratch it with the point of the object of known hardness by pressing the object firmly but lightly against the unknown sample. If the know object is harder, you should see and feel a definite 'bite' into the sample.

3. Inspect for an Etched Line – When a mineral is scratched, a permanent indentation is created and powder from the softer mineral will come off. This powder must be brushed away to see if the mineral really got scratched, or if the powder of the softer mineral that was swiped across the specimen being tested created a scratch-like marking. When minerals of similar hardness are scratched together, it is difficult to tell which mineral (if not both of them) is really getting scratched because of this.

Mohs' Scale of Hardness Table 1 to 10

1 = Talc

Talc is the world's softest mineral and the lowest mineral on Mohs' Scale. Talc is a hydrated magnesium sheet silicate, which is repellent to water and chemically inert. It is translucent to opaque with an iridescent or pearly lustre. Talc is used in cosmetics such as talcum powder, as a lubricant, and in paper manufacturing.

Absolute Hardness: 1

2 = Gypsum

Gypsum is a soft mineral composed of calcium sulfate dihydrate. Gypsum occurs in nature as flattened or twinned crystals and transparent cleavable masses called selenite. When Gypsum has a silky and fibrous texture it is called Satin Spar.

Absolute Hardness: 2

3 = Calcite

Calcite is an anhydrous carbonate, and one of the most widely distributed minerals on the Earth's surface. It is a common constituent of sedimentary rocks. In crystallized form, Calcite has a vitreous lustre.

Absolute Hardness: 9

4 = Fluorite

Fluorite is a mineral composed of calcium fluoride. It is an isometric mineral with a cubic crystal habit. Fluorite is named for its property of fluorescence, or its ability to fluoresce under ultraviolet light.

Absolute Hardness: 21

5 = Apatite

Apatite is a group of phosphate minerals (hydroxylapatite, fluorapatite and chlorapatite) and is one of few minerals that are produced by biological organisms. Hydroxylapatite is the major component of tooth enamel.

Absolute Hardness: 48

6 = Orthoclase

Orthoclase (or feldspar) is an igneous rock forming tectosilicate (silicate) mineral and is a key component in granite. Orthoclase derives its name form the Greek word for 'straight fracture' because of its two cleavages at right angles to each other. Orthoclase crystallizes in the monoclinic crystal system.

Absolute Hardness: 72

7 = Quartz

Quartz is one of the most common minerals found in the Earth's crust. It has a hexagonal crystal structure made of trigonal crystallized silica (silicon dioxide). The typical shape of a Quartz crystal is a six-sided prism that ends in six-sided pyramids.

Absolute Hardness: 100

8 = Topaz

Topaz is a silicate or 'nesosilicate' mineral created from a combination of aluminium and fluorine. It crystallizes in the orthorhombic system and it's crystals are prismatic in form.

Absolute Hardness: 200

9 = Corundum

Corundum is the crystalline form of aluminium oxide and one of the basic rock-forming minerals. Corundum is naturally clear or coloured by impurities. Due to its hardness, Corundum is used as an abrasive in sandpaper. Emery is an impure and less abrasive variety of Corundum.

Absolute Hardness: 400

10 = Diamond

Diamond is the hardest natural occurring material. Diamond is a natural allotrope of carbon. The crystal bond structure of diamonds gives the stone its hardness and differentiates it from graphite, which is the main allotrope of carbon.

Absolute Hardness: 1500

Common Gemstones Against Mohs Scale of Hardness Chart

Agate = 7

Agate is a distinct and dramatically banded variety of chalcedony. It is composed of quartz layers and comes in a great variety of colours depending on the nature or composition of these layers. Agates tend to be translucent, or at least contain translucent bands, due to the fact that it is composed of microscopic fibres of crystalline quartz. Each individual agate forms by filling a cavity in a host rock. As a result, agate is usually found as a round nodule with concentric bands like the rings of a tree trunk. It is said to be named for the place it first was found, namely along the River Achates (now called the River Drillo) in Sicily.

Absolute Hardness: 100

Amazonite = 6

Amazonite is blue-green variety of microcline (a feldspar mineral). Its brilliant colour is attributed to the presence of lead or iron in its composition. It is an opaque stone, often found with white, yellow or gray inclusions and a silky lustre or silvery sheen. It varies in colour from greenish blue to light blue, to soft green, pink and yellow. The most prized colour is a rich clear watery blue, with large clear stones amongst the most valuable semi-precious gemstones available. Its name is derived from the Amazon River, although no deposits have actually been found there! The most sought after amazonite historically come from Russia, where deposits are found in granite along the Ilmen Mountains. Europeans familiar with the Russian stone confused it with another green stone from South America's Amazon Basin, which turned out to be a form of Nephrite Jade but b then the name had stuck. The Pike's Peak district of Colorado, USA, became the most important source of amazonite after 1876 eventually put competing Russian mineral vendors out of business.

Absolute Hardness: 72

Amethyst = 7

Amethyst is a form of quartz formed in silica-rich liquids deposited in gas cavities, or geodes, in lava. It occurs in crystalline masses, but the crystals are generally not well developed, so they are generally found as clusters of crystal points. The stone's name is derived from the Greek word amethystos, meaning 'not drunken', as people of ancient times believed it to protect the wearer from drunkenness.

Absolute Hardness: 100

Aquamarine = 8

Aquamarine belongs to the beryl gemstone family, and has a more evenly distributed colour than its close relative the emerald. Gem quality aquamarine is usually free of inclusions and possesses a superior brilliance, while bead grade aquamarine tends to have interesting inclusions and opaque areas. The more intense the colour of this stone, the higher its value. Its name is derived from the Latin words for 'water' and sea'.

Absolute Hardness: 200

Carnelian = 7

Carnelian is a variety of the silica mineral chalcedony coloured by impurities of iron oxide. The colour can vary greatly, ranging from pale orange to an intense almost black coloration. Brighter colours are usually the result of heat treatment. The name carnelian is said to be derived from the Latin word carnis, or 'flesh', due to its colour.

Absolute Hardness: 100

Citrine = 7

Citrine is a clear yellow variety of Quartz, ranging in colour from pale yellow to yellow-brown, to deep red. Citrine occurs in proximity to Amethyst and the two can be found mixed as Ametrine. In fact much of the citrine on the market today is actually heat-treated amethyst. All that is required is for a kiln to reach and hold a specific temperature for long enough and a purple amethyst will turn to citrine. Natural citrine is not common and occurs in lighter hues than the heat-treated material. The name citrine comes from the French citron, or 'lemon', after its colour.

Absolute Hardness: 100

Emerald = 8

Emerald is a green variety of Beryl whose name is derived from the French esmeraude, which in turn goes back, via Latin, to the Greek root word smaragdos, meaning 'green gemstone'. The green coloration is caused by small amounts of chromium and enhanced by traces of iron. Unlike other Beryls, Emeralds often contain inclusions and other flaws. These flaws are not considered negative aspects but are instead considered part of the character of the stone. However these inclusions can cause Emeralds to be brittle and they need to be protected from hard contact. Emeralds also tend to have thin scratches on their surface requiring the application of a layer of wax or oil to smooth out their appearance and enhance their colour.

Absolute Hardness: 200

Garnet = 7

Garnets are a group of common silicate minerals that have similar crystal structures and chemical compositions. They are named after the Latin granatus for 'seed like', possibly because the crystals resemble the fruit's colour and shape. That said garnets actually come in a wide array of colour variations, including reds, red pinks, oranges, greens, yellow browns, and some that change colour throughout the stone. These stones are formed under high temperatures and pressures and as such are used by geologists as a gauge for the formation of other rocks in the vicinity. They are also an indicator mineral for diamonds. This gemstone owes its brilliance to a high refraction of light.

Absolute Hardness: 100

Jade = 6

Jade is a name that for many centuries was applied to gemstones people were bringing to Europe from China and Central America. It wasn't until 1863 that it was realised that the term 'Jade' was being applied to two different minerals. Because of the difficulties in distinguishing between these two minerals, even today they are both still called Jade. The first mineral, Nephrite, is an amphibole silicate (basic magnesium iron silicate) and is usually only green and creamy white. The second, Jadeite, is a sodium aluminum silicate that can have the full range of colours known as Jade.

Absolute Hardness: 72

Jasper = 7

Jasper is a semi-precious stone prized since antiquity, named from the Greek word iaspis, meaning 'spotted stone'. This form of semiprecious chalcedony, or microcrystalline quartz, is usually red, brown or green. Its patterns are much less regular and defined than those of the other chalcedony variety, agate. They derive their colourful patterns from the presence of other minerals. Jaspers are generally opaque due to the inclusion of microscopic 'grains' of crystalline quartz.

Absolute Hardness: 100

Labradorite = 6

Labradorite is a catch all term for a sodium-rich variety of plagioclase feldspar found in igneous or metamorphic rocks. When light hits labradorite from a particular angle it can display striking rainbow coloured reflections known as schiller. Stones with a light green-gray base and moderate schiller are known simply as labradorite. It was officially discovered on St. Paul Island in Labrador, Canada, in 1770.

Absolute Hardness: 72

Lapis Lazuli = 6

Lapis Lazuli is is a semi-precious stone prized since antiquity for its intense blue colour and inclusions that shine like stars. Its name is a combination of the Latin word lapis or 'stone' and the Arabian name azul meaning 'blue'. It is composed of grains of several blue minerals, including lazurite and sodalite. This complex, opaque gemstone additionally has a matrix of calcite and speckles of pyrite giving it a distinctive fluorescence. The rich blue color is due to the sulfur inherent in the structure of lazurite.

Absolute Hardness: 72

Onyx = 7

Onyx is is a cryptocrystalline form of quartz. Or put more simply it is a striped, semiprecious variety of agate, with white, black, brown or red alternating bands. It is different from regular agate only because the bands of which it is composed are parallel and regular. The name onyx originates from the Greek word onyx for 'fingernail' probably because of its weak transparency or possibly its colour.

Absolute Hardness: 100

Peridot = 7

Peridot (pronounced pear - ih - doh) is a variety of forsteritic olivine composed of magnesium iron silicate. Forged in fire, peridot is created under great temperatures and pressures deep within the Earth, and sometimes extruded in basaltic lavas. This mineral is coloured by iron and ranges from pale lime to rich olive green. Its yellow green colour is mainly dependent on the amount of ferrous iron present.

Absolute Hardness: 72

Ruby = 9

Ruby is a blood red gemstone and like Sapphire is a variety of the mineral Corundum (aluminium oxide). It takes its name from the Latin rubeus or ruber, simply meaning 'red'. Corundum is the second hardest natural mineral known to mankind. Pure corundum is colourless with the presence of chromium impurities creating the fiery coloured stone known as Ruby. Only red stones are called Rubies and corundum of any other colour is a Sapphire. So if the red colouring is too light the stone is called a Pink Sapphire. Colour is therefore the Ruby's most important feature, with transparency secondary. Inclusions don't affect the gemstone's

quality (unless they decrease the transparency), but act as the gemstone's fingerprints.

Absolute Hardness: 400

Sapphire = 9

Sapphire, simply put is the non-red variety of Corundum (an aluminum oxide mineral) with Ruby being the red variety. Ruby and Sapphire are identical in all properties except colour. Corundum comes in many colours, and any colour other than red is referred to as 'Sapphire'. If the Sapphire is any colour but blue, it is preceded with a colour designation (for example pink sapphire or white sapphire). Sapphire is the most precious of blue gemstones, and is a most desirable gem due to its colour, hardness, durability and lustre.

Absolute Hardness: 400

Spinel = 8

Spinel is a hard glassy mineral consisting of an oxide of magnesium and aluminium. It is found as a metamorphic mineral and as a primary mineral in basic rocks. In such magmas, the absence of alkalis prevents the formation of feldspars, and any aluminum oxide present will form corundum (aluminum oxide) or combine with magnesia (magnesium oxide) to form Spinel. For this reason, Spinel and Ruby are often found together. It exhibits a wide range of colours including pink, orange, yellow, brown, blue, violet, purple, green and black with the most valuable colour being red.

Absolute Hardness: 200

Tourmaline = 7.5

Tourmaline is a complex crystal silicate mineral compounded with elements such as aluminium, boron, iron, magnesium, sodium, lithium, or potassium. Tourmaline is classed as a semi-precious stone and the gem comes in a wide variety of colours. Its name is derived from the Sri Lankan word tura mali, meaning 'stone of mixed colours'. Tourmaline appears in blue, yellow, pink, red, black, green and clear though each color of tourmaline is given its own name in the gem world, making tourmaline more a group of minerals than a single type. These include rubellite (pink to red), indicolite (blue), schorl (black), dravite (brown) and achroite (colourless).

Absolute Hardness: 100

Turquoise = 5

Turquoise is is an opaque, blue to green mineral that is a hydrous phosphate of copper and aluminium that often contains iron. It occurs naturally in shades ranging from sky blue to grey green, usually in locations where copper is hidden in the soil in high concentrations. Copper causes the blue colour, while the green colour is caused by iron or chromium. Because its colour varies depending on the surrounding soil make-up, many turquoise references include the name of the country, state or mine where they were found. Its name comes from the French pierre turquoise, meaning 'Turkish stone'.

Absolute Hardness: 48

Although still widely used within the jewellery world it is worth noting that Mohs' Hardness Scale measures relative hardness - Fluorite at 4 is not twice as hard as Gypsum at 2; nor is the difference between Calcite and Fluorite similar to the difference between Corundum and Diamond. It is for this reason that for a more scientific purposes the True or Absolute Hardness Scale was developed. Using a sensitive piece of equipment called a sclerometer, developed by Professer Thomas Turner in 1896, a comparison of the absolute hardness of minerals can be measured. This test measures microscopically the width of a scratch made by a diamond under a fixed load when drawn across the face of the specimen under fixed conditions. Most minerals are close in hardness but as hardness increases, the difference in hardness greatly increases. Using the Absolute Scale you can say that Corundum is actually 4 times softer than Diamond, not half as soft as Mohs relative scale leads us to believe. For comparison purposes Absolute Hardness figures have been provided alongside Mohs' values for all the minerals detailed above.