

# Corundum

## *The Magic of Ruby*



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*Photos courtesy of American Gemological Laboratories*

**D**id you know that rubies and sapphires are basically the same thing – the same mineral, called corundum? They have the same chemical composition (an aluminum oxide –  $Al_2O_3$ ) and physical properties, their color being the primary difference, due to minute impurities during their formation. If you're not shocked to find that ruby and sapphire are basically the same, are you aware that these different family members can be found in practically every color of the rainbow?! When corundum is found in red, we call it ruby; the richer the red, the more chromium (as opposed to iron) in the ruby's composition (and usually the more "stressed" the stone will be). When it is blue, lavender, pink, orange, yellow, green, colorless, and any other color than red, we call it sapphire (the colors due to various trace elements, as I mentioned, typically chromium, iron, vanadium and titanium). There are certain differences, most probably due to the various properties of the trace elements themselves, that are characteristic of these various family members. For example, fine blue sapphires (and many

other varieties of sapphire) can be found in much larger sizes than fine rubies – a fine sapphire of 20 carats or more can be found for a price, while a ruby of fine quality of 20 carats is practically impossible to find at any price – the key word here being "fine", or as we in the trade call it, "gem" quality, denoting the very finest of its kind. There are also certain types of inclusions trapped in the stone's formation that are more commonly found only in specific colors of corundum. Some of these can add to the stone's value, while most tend to detract. Minute rutile crystals, which are commonly found in many of the variations of corundum, when "en mass" and aligned properly to the corundum's crystalline structure, create the phenomenon known as asterism, or the "star" effect sometimes found in ruby and blue, pink, and lavender sapphire, but only very rarely seen in yellow sapphire, and not at all in the other colors. While these inclusions create a 6-rayed star, and affect the transparency of the gem, in the case of perfectly aligned rutile crystals, this adds to the value of the stone, not detracts from it. If the star effect is an example of "positive" inclusions, the more common inclusions that detract from a stone's value are those that effect its beauty, or durability, such as large crystals within the stone, or stress fractures, or





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uneven color saturation (where the color appears in streaks, to varying degrees); blue sapphires tend to be found more often with uneven color saturation than their siblings, while very red rubies tend to have more “stress” or fractures than its counterparts, although all forms of corundum can have any degree of these inclusions that I’ve just mentioned.

It is also noteworthy to mention that this gemstone is the hardest of all the minerals, just after diamond, being #9 on the Moh’s hardness scale (which ranges from 1-10, the hardest, diamond, being #10).

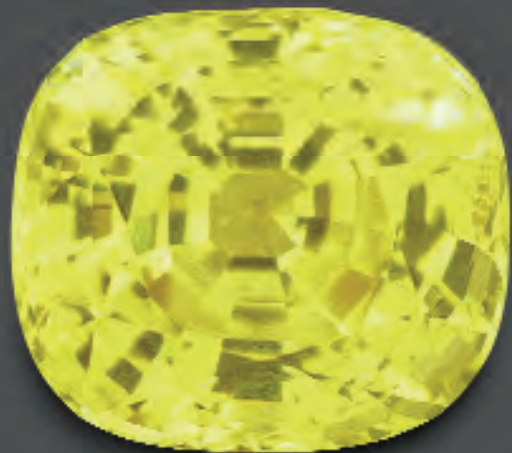
Just as any other gemstone, such as diamond, the 4 “C”s apply to corundum as well – color, cut, clarity and carat (See Antiquorum Vox 2001, page 24, article “For The Love Of Diamonds”). However, just as with any other colored gemstone, the 4 C’s are not necessarily equal; when the color is superb, the order of importance of the 4 C’s is as follows: color, color, color, and color!! The more “perfect” the color, the more rare the stone and less importance is given to the cutting, clarity, and even the carat weight of the stone, unlike diamond. However, if the color is average, or not very fine, the other elements in grading the stone become much more important; the cut and clarity had better be much finer, and it is easier to find such stones in much larger sizes!

So, keeping these things in mind, let us take a closer look at this marvelous family of corundum.

**Ruby** still reigns as king of the family, as it has throughout history. One of the oldest mined gemstones, the finest examples are still mined in the Mogok region of Myanmar (formerly known as Burma), as they have been for centuries.

Perhaps because of its red color, ruby has always been associated with passion and love, (as well as a host of other fascinating “superstitions”!) and historically, the ruby betrothal ring was used long before the diamond engagement ring appeared. Perhaps this is also due to the fact that fine ruby is as hard to find as “true love”; a gem ruby of exceptional color – as close as possible to a pure spectral red, with very few inclusions, in a large size (over 4 carats!), which has not been artificially enhanced by modern technology, is so hard to find that it will command a price that hardly any other gemstone on the planet can top (a 32.08 carat ruby holds the world record, selling at auction for US\$ 144,000 per carat, or US\$ 4,600,000 for the stone).

The “queen” of the corundum family is sapphire, referring to **blue sapphire** (when there is no adjective describing color before the word “sapphire”, it is usually understood that this refers to the blue variety of sapphire). Historically, the finest blue sapphire is also found in Myanmar (Burma), as is still the case today, and in Kashmir; the Kashmir sapphire being the rarest, producing gems of the finest quality which were mined for only a few decades (late 1880s through the beginning of the early 20th century), and which are highly sought after today! Sri Lanka (formerly Ceylon) is one of the largest producers of fine stones, some of which rival the more expensive provenances just mentioned. There are many localities around the world which produce sapphire, including our own Montana, USA, which produced small, fine, bright stones. Once again, the “perfect” color is as close to the spectral blue (of a rainbow) as possible, without undertones of gray, purple or green. Blue sapphire is often found in much larger sizes than ruby, as I mentioned.







I have seen many fine stones in sizes over 100 carats, and it is possible to find the "gems" – those of truly exceptional color and practically free of inclusions, in sizes well over 20 carats. Blue sapphires are also much easier to find with fewer inclusions than many other varieties. It is much easier, relatively speaking, to find a fine sapphire than a fine ruby, which accounts for a very different price per carat for these two siblings - sapphire, however, being highly underrated in my opinion! (A fine Kashmir sapphire of 21.29 carats sold at auction in November 2001, for over US\$ 44,000/carats, or US\$ 950,000 for the stone.)

Many of you may not be familiar with the prized **padparadscha** variety of sapphire. This literally means "lotus flower" in Sri Lanka, where the finest of this variety is found. Its color is one of the most unusual and distinctive in the world of gemstones - a harmonious blend of pink and orange, somewhat salmon colored. These gems are found in sizes larger than their ruby counterpart, but often smaller than many blue sapphires – fine stones usually are under 20 carats. They are generally lightly included, and should be bright. But the color says it all for this gem! And the color should be harmonious, not "zoned" or streaked with the separation of pink and orange! I do not know the record price paid for a padparadscha sapphire, but the wholesale for a 5 to 10 carat stone varies from approx. US\$ 5,000 - US\$ 7,500 per carat for a fine stone - a bargain when you consider its beauty and rarity!



Another precious member of the family is the **pink sapphire**.

This variety can cause some confusion, as certain countries consider it a variety of ruby (as many fine rubies have a pinkish undertone), while most of the world makes a distinction between the two. The finest examples exhibit a truly vivid, or "hot" pink coloration which is usually characterized by an exceptional brightness, not often seen in the species. They are also usually only lightly included, but not found in very large sizes (over 3 carats is considered large). The finest gems are mined in Myanmar (Burma) and Sri Lanka (Ceylon), and are somewhat comparable in price to padparadscha sapphires.

There are so many other beautiful members of this family that it would take a book to accurately describe them all, and well as all the properties. But perhaps some of the best bargains in the gemstone market are some of these "fancy colored" sapphires that are not well known, or not well publicized. The **purple sapphire** exhibits a lovely hue of purple, as do the **green** and **yellow sapphire** and these stones are usually only lightly included, and cost only hundreds of dollars per carat, or less (as opposed to many thousands of dollars per carat). Then there is the **color-change sapphire** that changes from blue to purple when taken from fluorescent





light to incandescent light, which again is much less expensive for fine stones than their ruby and blue sapphire siblings of similar qualities. The phenomenal stones – those which exhibit an optical phenomenon, such as the “star” effect, are rarer in the fancy colors, such as purple or lavender, and exceptionally rare in the yellow variety, and will be relatively more expensive than the figures that I just mentioned, but still do not fall into the “gem ruby” category.

One important factor to keep in mind is that **most varieties of corundum are routinely enhanced by heat or fillings**. Heating has been done for decades, to improve the color (to darken or lighten the natural color!) and melt away some of the internal impurities, or inclusions, such as rutile crystals known as “silk”; however, this process is stable and permanent. More recently, improving the stone’s appearance by the filling of tiny fractures has become a fairly common practice as well. “Surface diffused” sapphires (commercially available only in the blue variety for the moment) are sold today for those who want the look of a nice sapphire but who do not have the finances to purchase such; however, these sapphires have had only a minute portion of their “skin” treated, and any chip or damage to the stone will

reveal the basically colorless, “valueless” material underneath (buyer beware – this treatment must be revealed to the buyer and disclosed on the bill of sale)! All of this is to emphasize how rare and wonderful it is to find the natural stone that has had no enhancements of any kind. These gems will cost more, if they are of fine quality, but the added value will hold its value, and knowing that these gems have not been technically interfered with by man, but that the beauty of these gems was created naturally, by nature, “enhanced” only with the cutting of the crystal, is worth the extra premium.

I have only scratched the surface of this vast mineralogical family known as corundum, and I would be happy to further discuss this subject with any of our readers who wish to do so, as this is my favorite mineral! I hope I may have opened the eyes of some enthusiasts who may not have realized just how vast this family is. Ruby is the birthstone for July, but just imagine how many different choices there are for the month of September, whose birthstone is sapphire. The vast assortment of colors, from rich reds and royal blues, bright pinks and oranges and all the pastels that one can imagine to colorless, combined with the hardness of the mineral, allowing it to be cut and polished, or fashioned to the highest degree, along with the stone’s history and folklore, make this a beautiful choice for the gemstone enthusiast, and classify corundum as one of the noblest of all of the gem species!

