



GEMCLOUD



RUBY

EDUCATIONALSERIES

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RUBY

INTRODUCTION



RUBY

BIOGRAPHY

Photo credit: Robert Matthew Lavinsky



Species: Corundum

Variety: Ruby

Chemical Composition: Aluminum Oxide (Al_2O_3)

Trace Elements Causing the Colour: Chromium

Colour: Purplish red, red, orangy red, pinkish red (see next page)

Refractive Index: 1.760 to 1.770

Specific Gravity: 4.00 (+/- 0.05)

Mohs Hardness: 9

Pleochroism: Orange red to purplish red

Fluorescence: Weak to strong red under Long and short wave. The higher the content of chromium the more fluorescent the ruby is.

Common Inclusion: Needle, fingerprint, straight and hexagonal growth banding, twinning lines, crystals.

Most Common Shapes: Oval, round, cushion, pear



RUBY VALUE



The value of a ruby is based on the combination of 6 different parameters:

COLOR

This is the most important parameter. The purer the shade of red, the higher the value.

CLARITY

The clarity of rubies is evaluated with the naked eyes - Rubies free of inclusions are very rare. Visible inclusions are quite common. Nevertheless, the higher the purity the higher the price.

CUT

Rubies which are cut with a good level of symmetry, proportion and polishing command the highest prices.

CARAT

Because large stones are rarer than small stones, their prices are exponentially higher. The per carat difference in price between a 1 carat and a 10 carats ruby can be as big as 100 times.

TREATMENT

Untreated stones are rarer than treated stones. This factor has an impact on the price, making it higher for untreated and lower for treated stones.

ORIGIN

Some origins command premium prices, even for stones which are visually the same.



RUBY

PRICING HISTORY

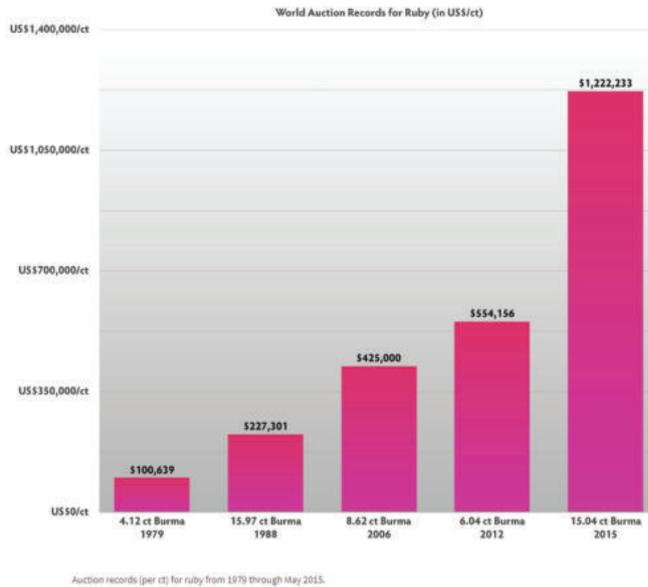


Photo credit: lotusgemology.com

As witnessed during international auctions, ruby prices have kept increasing. The price has multiplied by 12 during the last 40 years, which makes rubies an attractive long-term investment.

The record prices mentioned on this slide are for similar quality stones of Burmese origin and sold at international auctions such as Sotheby's and Christies (<https://www.lotusgemology.com/index.php/library/articles/160-under-the-hammer-ruby-sapphire-auction-records>) – note that this is also reflecting the market for stones of other origins, especially Mozambique rubies.

This is due to a combination of very high rarity and a demand for ruby that is constantly increasing.

Ruby is currently the most expensive colored gemstone, both per carat and total price.



RUBY

INTERESTING FACTS ABOUT



Photo credit: gemmecouture.com

Below are some interesting facts about rubies:

- The word Ruby comes from *ruber*, meaning red in Latin
- Rubies are mentioned 4 times in the Bible
- In the ancient language of Sanskrit, ruby is called 'Ratnaraj' which literally means 'king of precious gemstones'
- They are a symbol of nobility, royalty, love, passion, fire and power
- In Burma, warriors wore rubies to make them invincible in battle
- Ruby, along with sapphire, is the hardest gemstone after diamond
- Red is the most attractive color for the human eye
- Most expensive gemstone among all colored gemstones
- It is the July birthstone
- Wedding anniversary: 15th and 40th



RUBY

CATALOGUE & NOMENCLATURE



RUBY

PRIMARY AND SECONDARY HUES



Purplish Red



Red



Orangy Red



Pinkish Red

Color is the most significant factor affecting the value of a ruby.

Color preferences do change with time and from culture to culture. Nevertheless today the most sought after color is a pure red hue with a slight hint of purplish or orangy secondary colors, and a medium to medium dark tone. As the secondary color becomes more intense, the value of a ruby decreases – the lowest prices being for shades of red that display a strong purplish or orangy overtone.

GEMCLOUD classifies rubies between 4 different shades of red:

- **Purplish Red:** Rubies with a purplish secondary hue.
- **Red:** Rubies with a pure shade of red to very slight purple or orange secondary hue. This is considered the finest hue for a ruby.
- **Orangy Red:** Rubies with an orange secondary hue.
- **Pinkish Red:** Rubies with a lower saturation of red which tend towards pink.



RUBY

COLOR GRADES

GEMCLOUD classifies the different color intensities of rubies into 5 different grades:



Dark

Moderate to strong saturation of color with a very dark tone.

Trade name: dark red



Deep

Moderate to strong saturation of color with a medium dark to dark tone.

Trade names: royal red, pigeon blood (on the darker side), strong red



Vivid

Vivid saturation of color with medium to medium dark tone. This is considered the finest combination of tone and saturation for a ruby.

Trade name: Pigeon blood



Intense

Moderate saturation of color with a medium light tone. The hue of this grade is between red and pinkish-red.

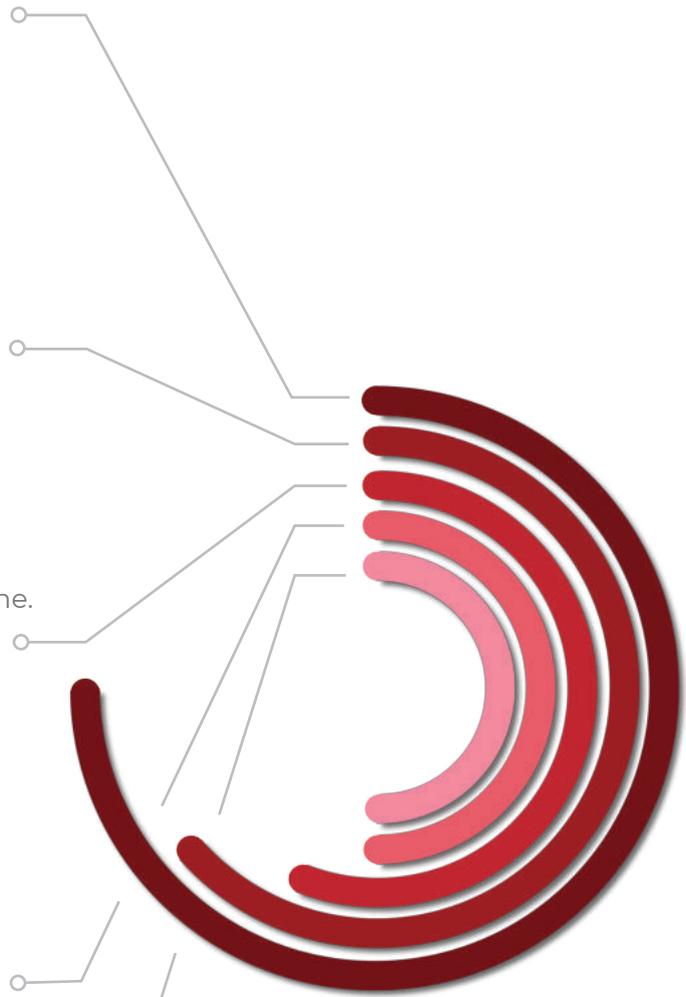
Trade name: pink ruby



Medium Intense

Moderate saturation of color with a light tone. The hue of these rubies is considered pinkish-red and this intensity is the border between ruby and pink sapphire.

Trade name: hot pink



RUBY

RUBY VS PINK SAPPHIRE



Ruby and pink sapphire both belong to the corundum family and both owe their color to the same trace element: chromium – the only difference between the two is the degree of saturation of color.

While ruby needs to have at least a slight hint of red, pink sapphire remains pink – the distinguishing edge between the two can sometimes be slightly subjective and in fact varies from gemological laboratory to gemological laboratory (depending on their color master set).

The economic value of rubies is higher than pink sapphire because they are rarer in nature and traditionally, more coveted.



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PIGEON BLOOD



The term *Pigeon Blood* originates from the valley of Mogok, Burma (Myanmar) and has been used for centuries.

The legend says that this term was coined while comparing a ruby to the 'first two drops of blood' from a freshly killed pigeon.

It was traditionally used to describe the finest color of Burmese rubies, a bright vibrant glowing red with none to very slight overtone of purple.

Nowadays, most gemological laboratories use this old trade name to describe some shade of red rubies – nevertheless, most of them use their own standards with different ranges of colors, hence the term Pigeon Blood today refers to a very wide and arbitrary range of red.

GEMCLOUD uses the term vivid red to describe the finest ruby colour – this color grade can be compared to the famous pigeon blood red color (note: Pigeon blood is not mentioned on the feed).



RUBY

GEMCLOUD CLARITY GRADES



Transparent



Translucent



Opaque

GEMCLOUD grades all its gemstones through a universal clarity standard composed of 8 different grades (6 transparent grades, 1 translucent grade & 1 opaque grade) divided into the below:

TRANSPARENT

Transparent gemstones are the ones which have the property of transmitting light without serious diffusion.

GEMCLOUD grades transparent gemstones between 6 different grades: EC1, EC2, VI1, VI2, I1 and I2 (see next page).

TRANSLUCENT

Translucent gemstones are the ones which only have partial light going through due to their numerous inclusions.

GEMCLOUD grades translucent gemstones type with a single grade called 'translucent'.

OPAQUE

Opaque gemstones are so included that there is no light passing through the gemstones.

GEMCLOUD grades opaque gemstones with a single grade called 'opaque'.



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TRANSPARENT CLARITY GRADES

Clarity in transparent rubies is assessed by naked eye only and at distance of about 40cm. Transparent rubies that are free of inclusions are very rare and visible inclusions are common and accepted.



Eye Clean 1 (EC1):

Free of inclusions while looking with the unaided eye and very few inclusions visible while looking with a loupe. This is considered the finest clarity for colored gemstones.

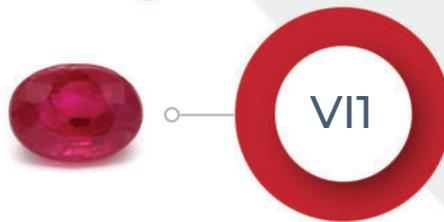
Potential other names: Top eye clean, Very minor inclusions, Very Very slightly included VVS



Eye Clean 2 (EC2):

Free of inclusions while looking with the unaided eye.

Potential other names: Eye clean, Minor inclusions, Very slightly included (VS)



Visible Inclusions 1 (VI1):

Inclusions very slightly visible with the unaided eye.

Potential other names: Slightly Included (SI)



Visible Inclusions 2 (VI2):

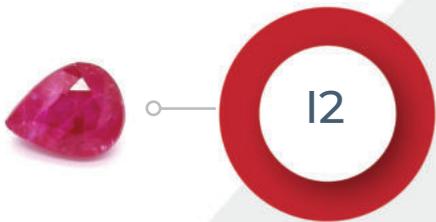
Inclusions slightly visible with the unaided eye.

Potential other names: Moderately Included (MI)



Included 1 (I1):

Inclusions highly visible with the unaided eye



Included 2 (I2):

Inclusions very highly visible with the unaided eye



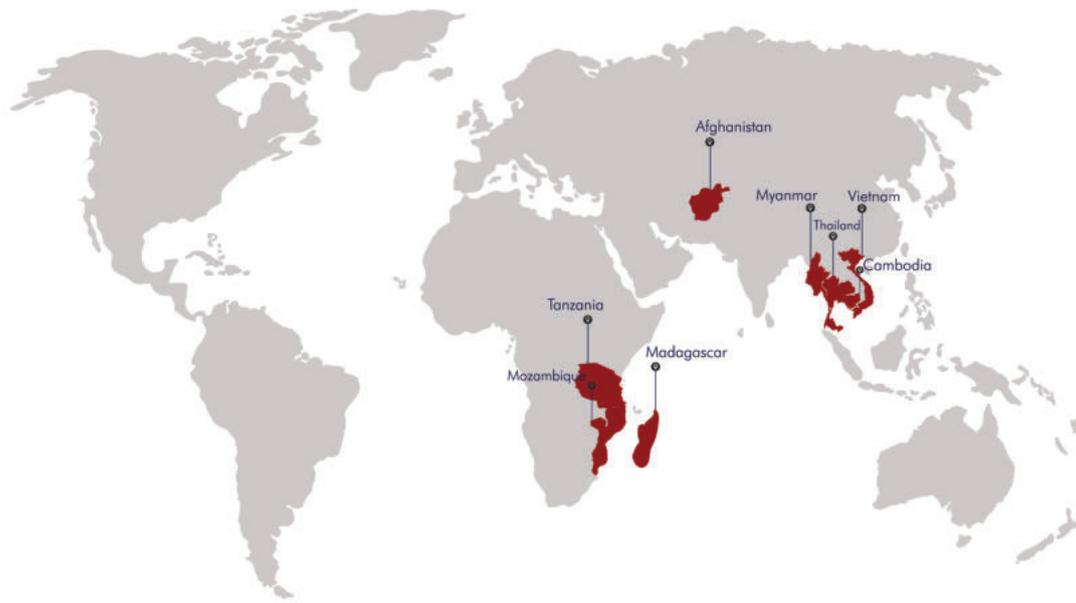
RUBY

ORIGINS IN GEMCLOUD
CATALOGUE



RUBY

GEOGRAPHIC ORIGINS



GEMCLOUD catalogue includes rubies from the most common sources:

- Afghanistan
- Burma (Myanmar)
- Madagascar
- Mozambique
- Tanzania
- Thailand / Cambodia
- Vietnam

The ruby catalogue will have different to variations from time to time.



RUBY

DETERMINATION OF ORIGIN



Rubies coming from different mining areas have a different chemical signature and different type of inclusions. This is due to the fact that they were formed in different geological environments.

These chemical signatures and the different type of inclusions are like fingerprints of humans and they help gemologists to distinguish the different origins.



RUBY

BURMA, MYANMAR



Photo credit: jewellerynet.com

Burma (today called Myanmar) is the most historical and oldest mined ruby source. Rubies have been mined here for centuries.

Burmese rubies are mined through a hard rock mining process that makes it difficult to recover high quality gems.

Rubies from Burma are very rare and fine, unheated gem quality stones over 1 ct are considered exceptional. Their color vary from pinkish red to purplish red to a very fine glowing vivid red color.

The term 'pigeon blood' was coined a few hundred years ago to describe the finest quality of Burmese rubies.

Because of marketing and since Burmese rubies have been associated with royalty for centuries, rubies from Burma command premium prices on the international market.

In 2015, a Burmese ruby of 25.59 cts named the 'Sunrise ruby' was sold at Sotheby's Geneva for 30.42 M USD - the highest price ever paid for a colored gemstone in history (visual on the top).



RUBY

THAILAND / CAMBODIA



Photo credit: Philippe Ressigeac

The ruby mines of Siam are a known source since the 15th century. They are located near the city of Chanthaburi, along the Cambodian / Thai border – this area is considered today as the biggest worldwide trading centre for rubies. Thailand along with Cambodia and some Madagascar rubies can be described as coming from a 'Basaltic' origin – meaning that they were all created in the earth crust and brought to the surface by volcanic activity.

Siam rubies are recovered from old riverbeds where they have been travelling for millions of years.

While the area was the biggest producer of rubies during the 1980's, today the mines are almost depleted and in the local Thai market these rubies are considered a true collector's item.

Provided that geologically the deposits located on the Cambodian and Thai sides are the same, it is impossible for gemologist to accurately separate the two origins by using their chemistry and internal features. For this reason gemological reports mostly state Thai origin.

Thai / Cambodian rubies tend to be slightly dark and most of the production undergoes heat-treatment in order to improve their color.



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VIETNAM



Photo credit: Philippe Ressigeac

The ruby mines of Vietnam were a recent discovery dating back to the beginning of the 90's . They are located in a mountainous area called Luc Yen in Yen Bai, exactly halfway between Hanoi and the northern Chinese border.

Here rubies are recovered in a stunning karstic landscape – in both hard rock mining and old riverbeds.

Nowadays the production is mostly low-end quality and destined for the local gem painting market.

Vietnamese rubies have a very typical strong purplish pink/ fuchsia color – nevertheless the finest examples can be of similar quality to Burmese rubies.

The area is also famous for very fine star rubies with exceptionally thin, 6 ray stars.

Vietnamese rubies are commonly heat-treated to both improve their color and their transparencies.



RUBY

MOZAMBIQUE



Photo credit: Cartier

The major ruby deposit of Mozambique was discovered in 2008 and located in the northern part in a city called Montepuez.

The area is currently the main ruby deposit in the world and about 8 out of 10 rubies produced today originate from this mine.

Rubies are found in both primary rock and old riverbeds which produce a very large variety of different qualities.

Rubies from Mozambique have a very high transparency and their color ranges from red to purplish and orangy red to pinkish red – their quality rivals that of Burmese origin and it is sometimes impossible to separate these two origins visually.

The lion's share of the deposit is owned by Gemfields, the leading colored gemstone mining company – which auctions the production of rough rubies twice a year.

The visual on the top is a Cartier necklace named the Reine Makéda, set with a 15.29 carat oval-shaped ruby from Mozambique – This masterpiece was the star of the Biennale in Paris in 2014.



RUBY

MADAGASCAR / TANZANIA



Photo credit: Van Cleef & Arpels

While Tanzanian rubies were discovered in the 60's, rubies from Madagascar were discovered in the 80's.

Both origins produce a large ray of qualities, coming from both primary deposits and secondary, old riverbeds.

The color for both places varies from red to purplish and orangy red to pinkish red – overall, the quality is very similar to the quality of Mozambique rubies.

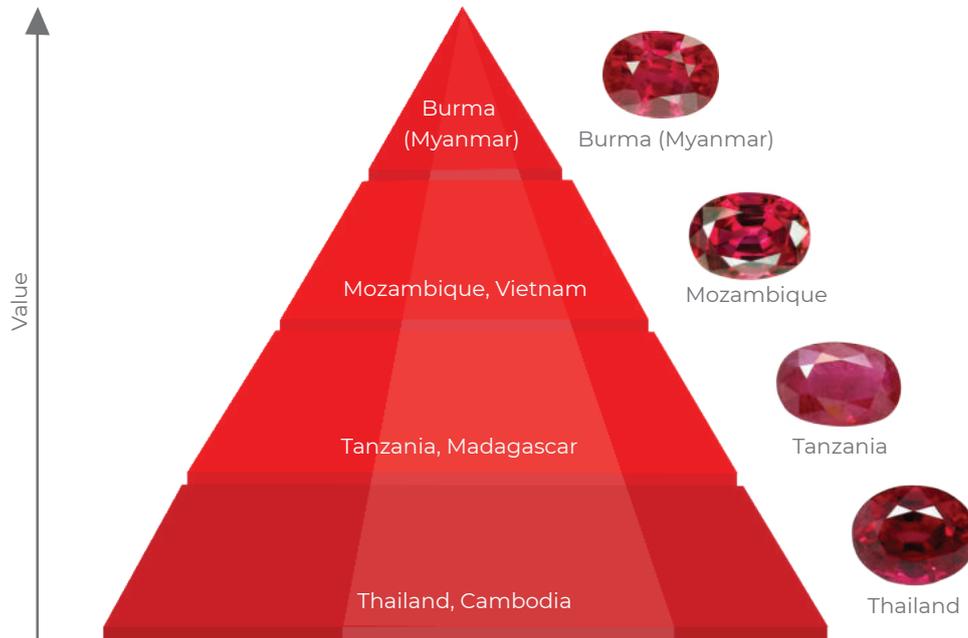
Production from these two areas is sporadic but frequent discoveries keep being made from time to time.

Some exceptional rubies have been unearthed in these two places during the last 20 years. On the top, a fine example with the Vermillion earrings, from Van Cleef & Arpels, which feature two oval-cut, unheated, perfectly matching rubies from Tanzania weighing 13.33 and 13.83 carats.



RUBY

HIERARCHICAL VALUE



We tend to associate a product quality with its geographic origin. As for most products, including watches and wines, this too is the case with gemstones.

In the case of rubies, different origins will have different prices even for similar looking rubies.

In reference to Rubies, Burmese gemstones command premium prices over other origins, which will be priced on a lower price range – even with the quality being equal.



RUBY

TREATMENTS IN GEMCLOUD
CATALOGUE



RUBY

RUBY TREATMENTS

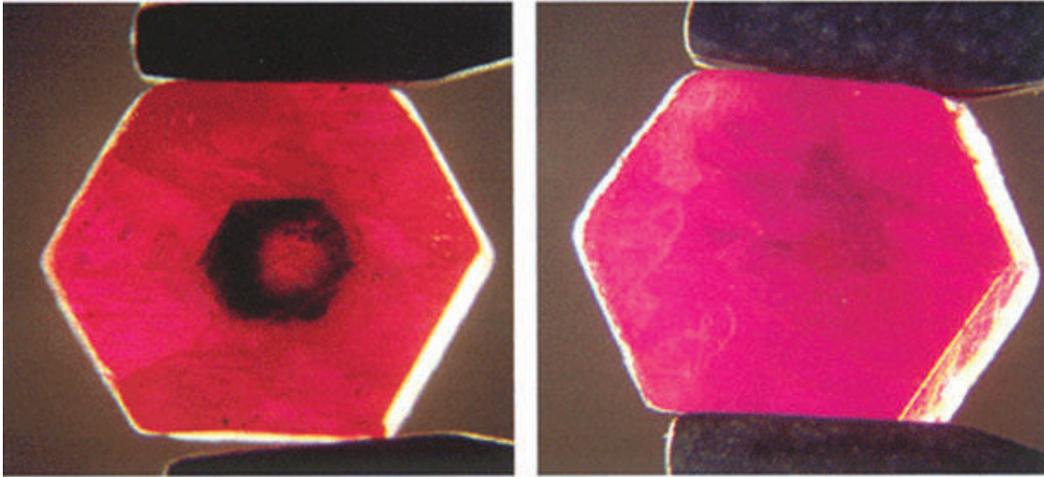


Photo credit: thenaturalrubycompany.com

The first mention about ruby heat-treatment dates back to Roman times and most of the rubies currently on the market have undergone heat-treatment for improving their color and/or transparency.

There are currently 4 major treatments for rubies:

Heated: Rubies that have been heated with high or low temperature in order to improve their color and/or clarity. These are considered less valuable than unheated rubies.

This treatment is permanent, stable and does not require any special care. These are usually referred as 'Heated' or 'H' on laboratories' reports.

Heated with flux: Rubies that have been heated with high temperature and a flux, usually borax, in order to improve their transparency/durability.

The treatment is permanent, stable and does not require any special care.

Gem laboratories will classify these between 3 different categories, based on the amount of flux residues within the gemstones:

Heated with minor residues - these are usually referred as 'H(a)', 'Heated (Minor residues)' or 'H(f1)' on gemological reports.

Heated with moderate residues - these are usually referred as 'H(b)', 'Heated (Moderate residues)' or 'H(f2)' on gemological reports.

Heated with significant residues - these are usually referred as 'H(c)', 'Heated (Significant residues)' or 'H(f3)' on gemological reports.



RUBY TREATMENTS



Before Glass-Filling

After Glass-Filling

Photo credit: gemologist.ph

Below are the two remaining treatments, which will not be present in the GEMCLOUD feed as these are not considered durable treatments:

Heated with Beryllium – to improve color

This treatment is usually referred as 'Diffused', H(Be) or 'Beryllium diffused' on gemological reports.

It is considered stable and does not need any special care, except for stones that need to be recut – the cutter would have to pay attention as the treatment is often located just below the surface (and so color can then be removed during the cutting process).

Heated with lead-glass – to improve clarity

This treatment is usually referred as 'lead-glass' or 'composite rubies' on gemological reports.

It is not considered stable and needs special care.



RUBY

TREATMENTS - IDENTIFICATION

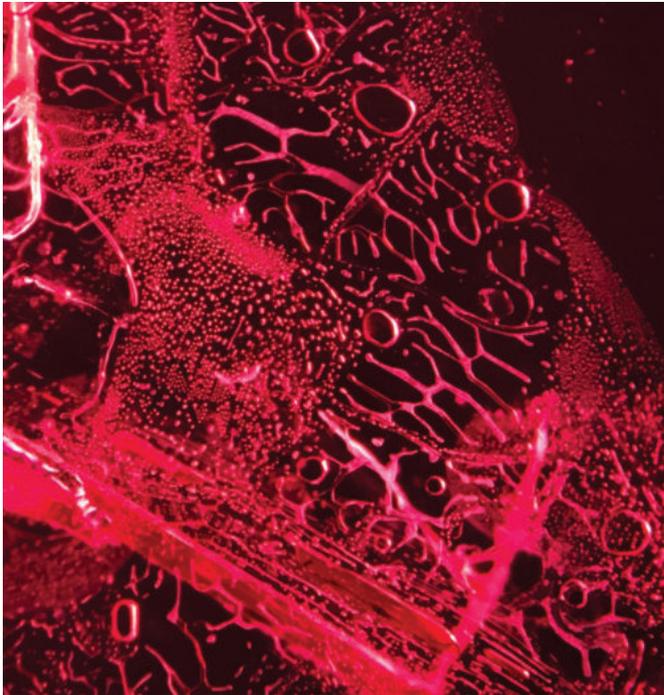


Photo credit: Sebastian Haensel

Gemologists identify treatments in rubies by studying both their internal features with a microscope and their chemical composition with advanced machineries.

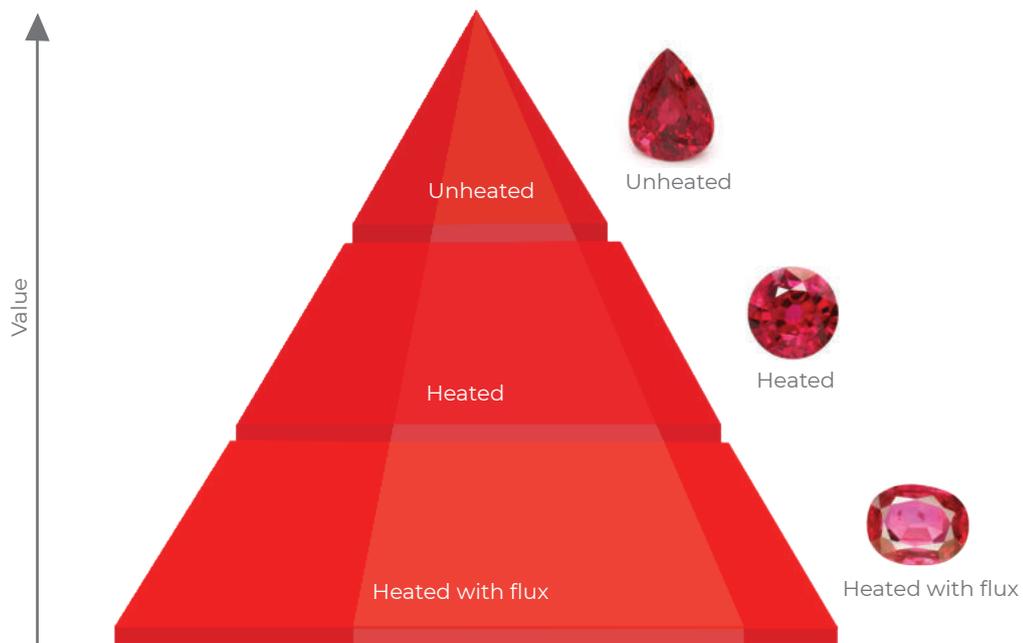
Because heat-treatment involves high-temperature that creates thermic shocks and modifies the aspects of internal features, gemologists are often able to find clues of treatment while looking with strong magnification under a microscope.

Photo: Gas bubbles and residues of borax in a heat-treated ruby.



RUBY

ECONOMICAL OVERVIEW



The fact that an unheated ruby is much rarer than a heated ruby which is itself rarer than a ruby heated with flux, it will command a different price – even between stones that are impossible to differentiate with the naked eye.

Indeed, the value follows the scarcity and so the rarer the ruby the higher will be the price. Below is an example of price comparisons between 3 different rubies that visually look exactly the same:

- Unheated vivid red ruby of 1 ct: 3,500 USD / total
- Heated vivid red ruby of 1 ct: 1,500 USD / total
- Heated with flux vivid red ruby of 1ct: 1,200 USD / total

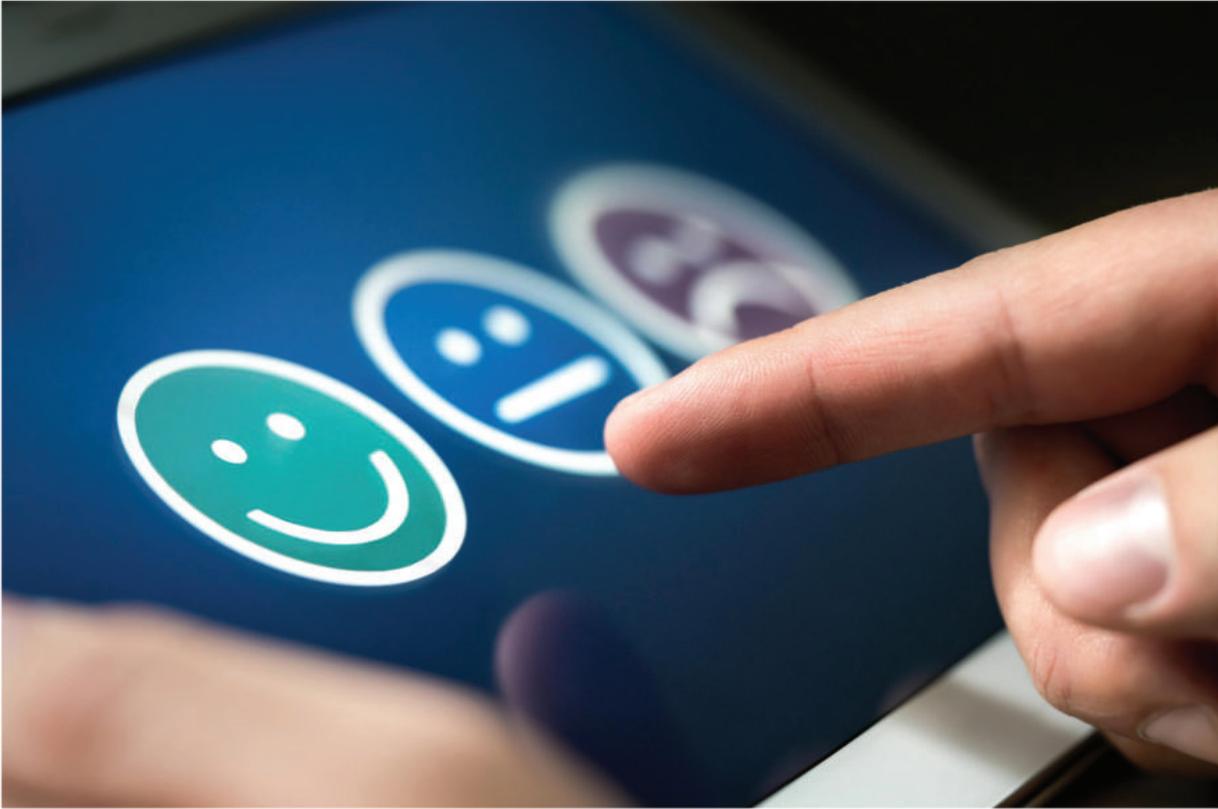
This price difference between treatments then grows exponentially as the rubies grow in sizes.

Note: this is just a basic example shown for guidelines and prices may vary from stone to stone and time to time.



RUBY

COMMUNICATING ABOUT TREATMENTS



Below is a list of arguments to emphasize while communicating treatments to end consumers:

- Heat-treatment of rubies is traditional and has been carried out for centuries.
- Heat-treatment of rubies is very common and well accepted.
- Most of rubies in the market are heat-treated.
- All treatments in our catalogue are permanent, stable and do not need any special care.
- Heat-treatment finalizes the unfinished work of mother nature.
- The term 'enhancement' is usually preferred to 'treatment' as it sounds less negative.
- All GEMCLOUD rubies are accompanied with a gemological report.
- All treatments on the portfolio are fully disclosed.



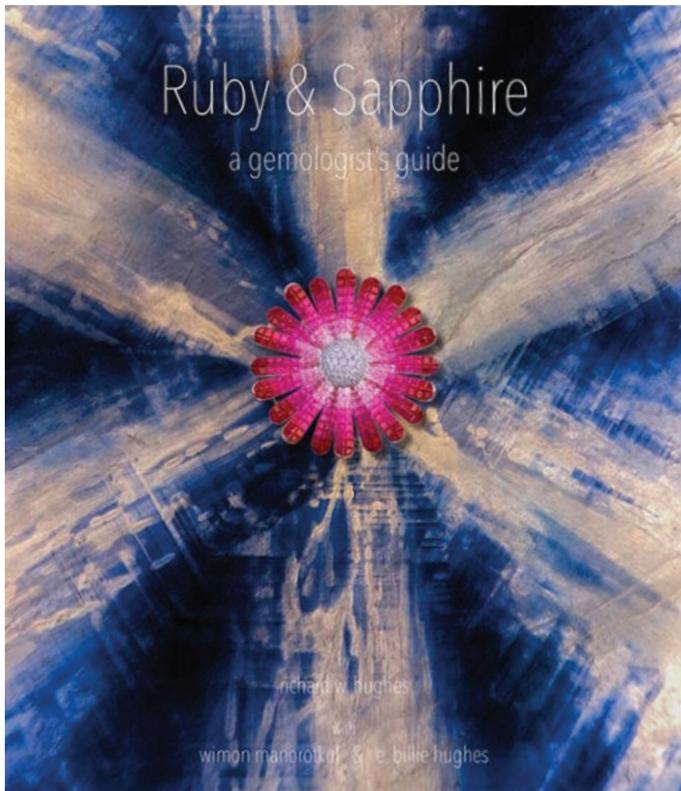
RUBY

LIBRARY



RUBY

BOOKS ABOUT RUBIES



Below is some books we advises you to read if you want to know more about rubies:

- 'Ruby & Sapphire, A Gemologist's Guide' by Richard Hughes – this is must as this book is considered the bible for information about rubies and sapphire.
- 'Ruby & Sapphire, A Collector's Guide' by Richard Hughes.
- 'The Book of Ruby and Sapphire' by Richard Hughes – interesting old narratives about Mogok and from the eyes of an English man. Very good for extracting marketing ideas.
- 'RUBY: THE KING OF GEMS' by Joanna Hardy – very interesting for extracting marketing ideas and historical facts.
- 'Secrets of the Gem Trade: The connoisseur's Guide to Precious Gemstones' by Richard Wise – Interesting book about colored gemstones in general.



RUBY

ARTICLES – GENERAL INFORMATION

Below is a list of interesting articles with verified information:

General information about rubies

- <https://www.gia.edu/ruby>
- <https://www.gia.edu/ruby-quality-factor>
- <https://www.gia.edu/gia-faq-gia-grade-rubies>
- <https://www.gia.edu/gia-faq-heat-treatment-ruby>
- <https://www.gia.edu/gia-faq-created-ruby>
- 'Ruby and-Sapphire-Production-and-Distribution' by GIA (Document attached separately)
- <https://www.gemstone.org/education/more-resources/30-education/fun-articles/211-science-of-stones-ruby>
- <https://palagems.squarespace.com/ruby-connoisseurship>
- <https://www.bloomberg.com/news/features/2018-11-20/rubies-have-never-been-more-expensive-as-ubiquitous-in-jewelry>
- <https://www.harpersbazaararabia.com/fashion/watches-jewellery/things-you-didnt-know-about-rubies>



RUBY

ARTICLES - TREATMENTS

Ruby treatments – General

- <https://www.gia.edu/gem-treatment>
- <https://www.gemsociety.org/article/gemstone-treatment-and-enhancement/>
- 'Corundum treatment' from 2013 by SSEF (Document attached separately)
- <https://www.gia.edu/doc/Gemstone-Enhancement-and-its-Detection-in-the-2000S.pdf>
- <https://www.jewelers.org/education/gemstone-guide/gemstone-treatments>
- <https://www.jewelers.org/education/gemstone-guide/gemstone-treatments>

Ruby treatments – Heated with flux

- 'Flux heated and glass filled rubies from Mozambique' by GIA (Document attached separately)
- <https://www.lotusgemology.com/index.php/library/articles/152-fluxed-up-the-fracture-healing-of-ruby>

Ruby treatments – Main laboratories Nomenclatures

- http://www.lmhc-gemology.org/pdfs/ISI_18012010.pdf
- <http://gemresearch.ch/enhancement-disclosure/>



RUBY

ARTICLES - ORIGINS

Burmese ruby

- <https://www.gia.edu/gia-faq-burma-ruby>
- <https://palagems.squarespace.com/burma-ruby>
- <https://www.nationaljeweler.com/blog/5071-5-things-to-know-about-burmese-rubies>
- 'The Rubies of Burma' by Keller (document attached separately)
- 'Ruby mining in Burma' by DeLeon (document attached separately)

Madagascar ruby

- <https://www.lotusgemology.com/index.php/library/articles/322-blood-red-rubies-from-madagascar-lotus-gemology>
- Ruby from Didy Madagascar - by Peretti Hahn (Document attached separately)



RUBY

ARTICLES - ORIGINS

Mozambique ruby

- <https://www.gia.edu/gia-news-research-gemfields-ruby-auction-singapore>
- https://www.gia.edu/doc/GIA_Ruby_Montepuez_Mozambique.pdf
- 'Gem.GRS JNA' from Nov2015 (document attached separately)
- 'Distinguish trait of Mozambique ruby' from JNA July 14 (document attached separately)
- 'Mozambique rubies prices' by Gemguide (Document attached separately)

Tanzania ruby

- New ruby from the Morogoro Area, Tanzania (document attached separately)
- SSEF - New rubies from Tanzania

Thailand

- Rubies from Thailand Cambodia by GIA (Document attached separately)
- <http://www.palagems.com/thai-ruby-henry-louis>
- <https://www.lotusgemology.com/index.php/library/articles/157-red-sky-at-dusk-hunting-the-last-siamese-ruby-miner>



RUBY

ARTICLES

Vietnamese ruby

➤ <https://www.gia.edu/doc/Ruby-and-Sapphire-from-the-Tan-Huong-Truc-Lau-Area.pdf>

➤ 'Mining Rubies Sapphires north Vietnam' by Kammerling et al (document attached separately)



Economical

➤ https://en.wikipedia.org/wiki/Sunrise_Ruby

➤ <https://www.youtube.com/watch?v=YN098Nb3MII>

➤ <https://www.lotusgemology.com/index.php/library/articles/160-under-the-hammer-ruby-sapphire-auction-records>

➤ <https://journal.haruni.com/blog/10-most-stunning-rubies-sold-at-auction>

