



Imperial Topaz

Ouro Preto, Brazil

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RED, ORANGE AND YELLOW IMPERIAL TOPAZ

Imperial Topaz: Introduction

While not a technical nor scientific term, imperial topaz is synonymous with Ouro Preto, Brazil for its naturally occurring rich colors of yellow, orange, red, pink, and purple. There are several legends as to the origin of the name, but clarity has been lost to time. "Topaz" is a very old term from "Topazios", described by Pliny as a legendary island in the Red Sea which produced brilliant yellow gemstones. While this assuredly was not topaz as we know it today, clarity on the subject has been lost to time. Some scholars postulate that it once referred to a yellow olivine (chrysolite) or chrysoberyl.

Many sources (including GIA) state that the "Imperial Topaz" name originated in the mid-19th century Russia as an honor to the czar for the beautiful pink topaz crystals found in the Ural Mountains. However, documents from Brazil show the name being designated in 1881 during the visit of the Emperor Dom Pedro II and the Empress Dona Tereza Cristina to Ouro Preto. Each of the royal members was presented with an orange-red crystal of topaz from the French citizen, Claude Henri Gorceix who later went on to open the Escola de Minas (School of Mines) de Ouro Preto. The name was meant to separate it from the "precious" topaz which represented the more common yellow coloration.

Imperial Topaz: Science

Topaz is a nesosilicate with the chemical formula $Al_2SiO_4(OH, F)_2$ where OH (hydroxyl) can substitute for up to 30% F (Fluorine). In fact, in Ouro Preto, most of the topaz does indeed have hydroxy predominance- up to 25% molecular weight which is different from most topaz worldwide.

Topaz forms in the orthorhombic system, where most topaz forms in a stubby, wide form. The topaz crystals of Ouro Preto are elongated prisms with striated faces and pyramidal, regular terminations. Topaz has perfect basal cleavage and most of the imperial topaz crystals from the Ouro Preto area are cleaved and only have single terminations. Of the rare doubly terminated crystals, many can appear hemimorphic with an inverted re-entrant pyramidal habit on one end.

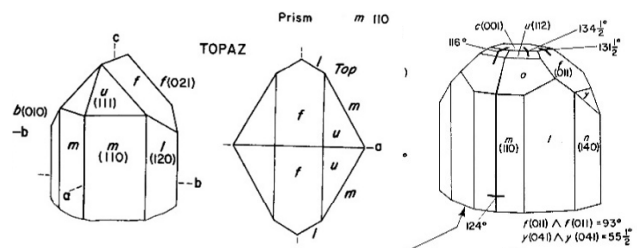


Figure 1. Typical worldwide topaz habit

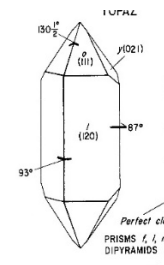


Figure 2. Typical Ouro Preto topaz habit



Figure 3. Sharp and regular pyramidal terminations on elongated prisms typical of Ouro Preto imperial topaz crystals



Figure 4. A rare double termination topaz crystal. The inverted pyramid habit can be seen on the lower termination. Doug Edmunds photo

Ouro Preto is the only commercial locality of orange to reddish gem material. The pink, red, and purple colors are secondary to chromium substitution for aluminum. It is said that bright purple and pink colors are obtained by heating orange and brown toned crystals that have chromium. There was at least one small pocket of naturally occurring purple topaz found in the 1960s, but natural heating may have caused the coloration. Little is discussed regarding this process. Brown colors are created worldwide with irradiation, but are typically subject to fading. The color of Ouro Preto are natural and resistant to fading and encompass 15 shades ranging from “malandro” which is colorless to wine colored. (Officially: malandro, greenish, pale yellow, champagne, honey, light yellow, egg yolk, orange, salmon, brandy, caramel, peach, rosy, cherry, and wine)

Imperial Topaz: Location

Ouro Preto is at the southeastern end of Minas Gerais District of Brazil. The mines typically run in an east to northeast direction in an old orogenic region. The Tripui stream is where gold was found leading to the settlement of the area. It is now a UNESCO world heritage site, and was the first designation in Brazil. It has a population of about 70,000.

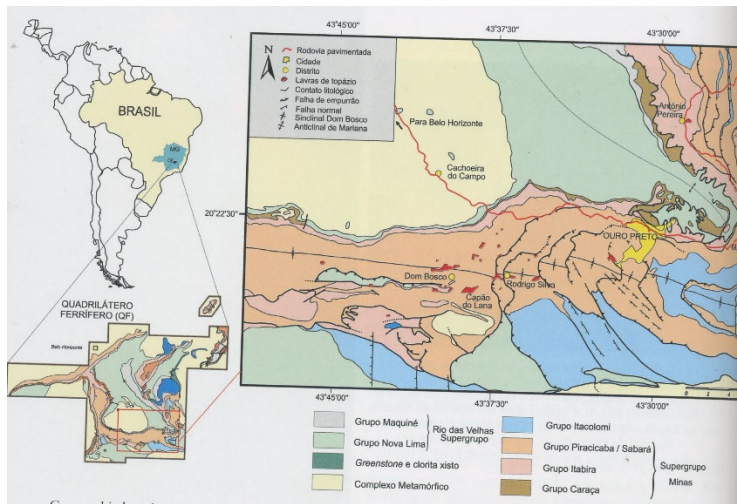


Figure 5. Map of the Mines of Ouro Preto. The mines are in red and show the surrounding rock types and formations. The town of Ouro Preto is shown to the right of center in yellow.

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Figure 6. Ouro Preto today.



Figure 7. Ouro Preto market and its famous Baroque architecture.

Imperial Topaz: History

Ouro Preto was a villa that was established around 1698 due to an influx of miners in search of gold. The translation of Ouro Preto is literally “Black Gold” and refers to gold nuggets found in the Tripui stream that had a black coating of palladium. Over 800 tons of gold were shipped back to Portugal in the 17th century, and in 1711 the town was renamed Vila Rica or Rich Village. It became the capital of the Minas Gerais Province in 1823 and lasted until 1898 when Belo Horizonte became the capital. At the time, it was the largest city in Brazil and was also twice the size of New York. Its affluence and size attracted intellectuals and artists from Europe. In 1789, a man named Tiradentes started the Inconfidencia Mineira movement which tried to establish autonomy and independence from Brazil. The movement failed, and Tiradentes was hanged as a traitor.



Figure 8. Historic postcard of Ouro Preto circa 1900. Some things never change

Topaz was found in Villa Rica around 1760 by most accounts and an official document from Sept 22nd, 1772 was made by the Count of Valadares recorded the presence of topaz in the Lavra do Saramenha. Apparently, this discovery was never fully appreciated as this area was totally abandoned until 1971 when it apparently was rediscovered by a tractor driver leveling an embankment for a new construction. Mineracao Vermelho was formed and subsequently purchased by an American where it was mechanically mined for gem production. It is only one of two mechanized mines – the other being Capao do Lana. Other topaz areas (see red areas in Figure 3) are hand mined by independent garimpeiros. Production is much smaller and more irregular as rain and floods create unworkable conditions.

Imperial Topaz: Geology

The beautiful crystal of Ouro Preto are found in strongly weathered and discontinuous channeled veins within a heavily decomposed carbonate rock. Because the topaz matrix is so heavily weathered, the exact mechanism of its formation has been the subject of debate. Most worldwide topaz is formed within pegmatites that have concentrated fluorine and aluminum. Topaz can also be formed from metamorphic action or even more rarely, in hydrothermal veins. The best theory by experts is that the Ouro Preto formation was created by hydrothermal fluids. This is supported by the fact that Ouro Preto topaz crystals have a high amount of hydroxy (OH) substitution for fluorine (F) which suggests that the temperature of formation was lower than what would be needed for a pegmatite origin. This is also supported by the presence of a high number of fluid inclusions within the crystal, and that the topaz formed at a relatively superficial depth.

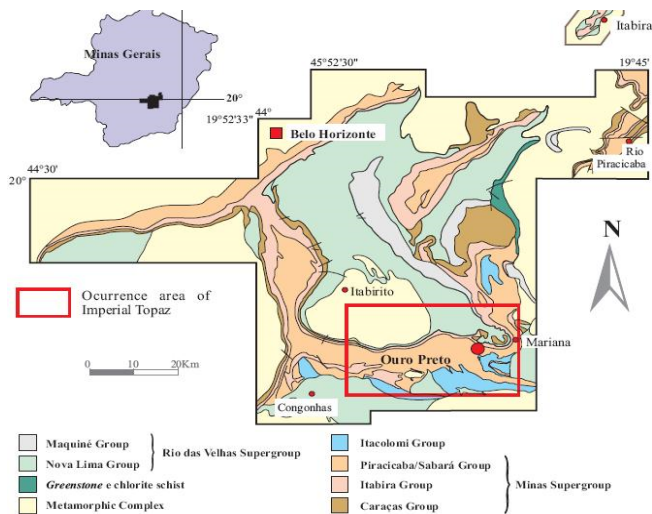


Figure 9. The significant geological zones of Ouro Preto

The host rock is from the Precambrian Minas Supergroup formation which was fractured during the mountain building which occurred around 600 million years ago. There was faulting of this rock, volcanic activity, and plutonic intrusions that occurred after this which led to heating of the host rock (metamorphism) and the creation of hydrothermal fluids. The hydrothermal fluids perhaps penetrated and cooled within the fracturing and faulting allowing the formation of topaz crystals.

The host rock is a gray to silvery color and generally composed of carbonatic phyllites (chloritic schists and micaceous clays), dolomites, and impure marbles. An indication that topaz is near is the change from this silver schist material (locally called “picarra”) to a brownish red clay that encases white lines of lithomarge that can lead to nests of topaz crystals.



Figure 10. The left depicts a sample of chloritic schist and the right shows miners in Ouro Preto walking through the stratified layers of chloritic schist and other rocks, giving an example of the host rock of the area



Figure 11. Mina do Capao. The silver schist of the host rock is seen surrounding the brown colored clay where the topaz crystals are found and the miners are actively working

The topaz crystals are usually found in these primary deposits (but can also be found as alluvial secondary deposits in streams). The clay is stained with iron- containing minerals such as hematite that gives it the reddish-brown look. Other minerals found with the topaz are quartz, specularite, and rutile. Very rarely, small gemmy euclase crystals can also be found.



Figure 12. Euclase from Ouro Preto on mica. John Betts specimen and photo

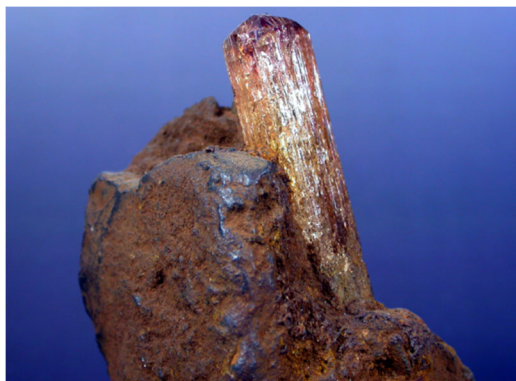


Figure 13. Orange topaz on its hematite and goethite matrix. Sergio Varvello specimen and photo



Figure 14. Two small topaz crystals in matrix

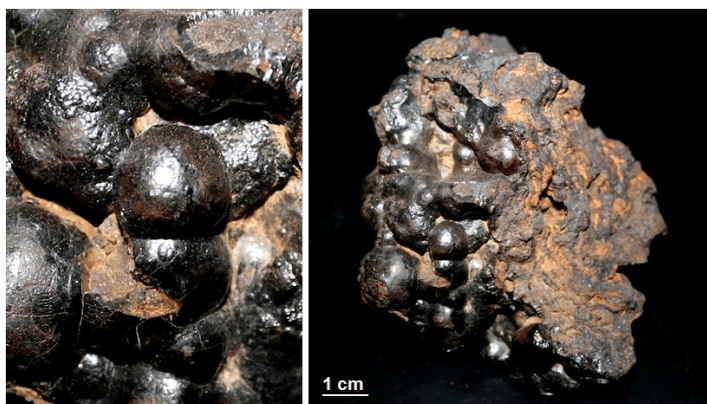


Figure 15. Goethite from Ouro Preto

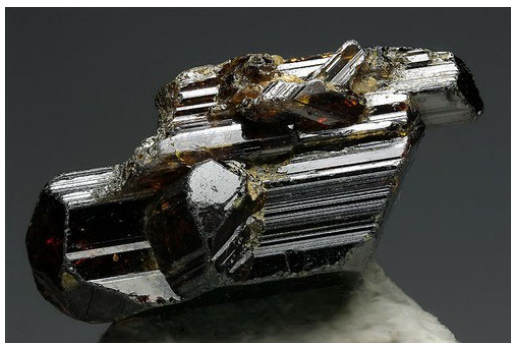


Figure 16. Rutile from Ouro Preto

Imperial Topaz: Mechanized Mining

There are two very different types of mining operations ongoing in the Ouro Preto region. There are two commercial and mechanized mines. The best documented is the Capao do Lavra (Mina do Capao) which I will further discuss. It is important in the commercial gem trade. The other mechanized mine is the Lavra do Vermelho of which very little is available publicly. This is in Saramenha and “Mineracao Vermelho” was reported as the mining venture in 1971. There are many rumors that perhaps this mine was or is owned and worked by Barry Yampol, but I am not able to ascertain any certainty to this idea. There are only 8 topaz crystals and no information available on Mindat.org, but in mining books published in Brazil, this is claimed to be one of the most productive sites. The largest imperial topaz was described as from Vermelho and is said to be 30 cm tall and 10 cm in diameter. There are no photos available of this piece. In the Mineral Treasures book by Peter Bancroft, Vermelho is described as synonymous with the Antonio Pereira, but the two mines are not even close geographically.

Lavra do Capao

The Lavra do Capao location utilizes teams of workers and overseers. They use backhoes and scrapers to dig through the host rock. Once the brownish red clay is uncovered, the supervisors will check the area for significant crystals and nests of pieces. The workers will then dig by hand and if nothing of large size is found, strong jets of water are pumped into the area to create a slurry.



Figure 17. Lavra do Capao. A backhoe works the country rock. The water pumps and hoses can be seen on the left of the photo



Figure 18. Lavra do Capao. A topaz crystal is discovered

The water loosens and washes off the soft clay material and then is pumped to the main building where it passes on a conveyor belt. Workers examined the material and place any crystals into a hermetic capture system to prevent theft. Smaller material is placed on screens to allow the clay to fall away and the small topaz pieces to be recovered.



Figure 19. Lavro do Capao. A worker at the conveyor belt places a topaz into the capture system tubing on the sides of the conveyor. The topazes are then carried off to the owner or overseer for examination

Each day approximately 400 cubic meters of rock and clay are withdrawn which yields approximately 1 kilogram of topaz. Of that, around 10 grams (1%) of the topaz material is facet grade. Occasionally, topaz is found in “buchos” which are geode type formations which then need to be broken apart and examined for crystals.



Figure 20. Lavro do Capao. A beautiful piece

Imperial Topaz: Traditional Mining

There are many small mines in the Ouro Preto Region. These include the Adao, Joao Sumido, Ze Leite, Rodrigo Silva (near Capao), but the largest of these is the Antonio Pereira mine. Traditional mining is artisanal mining done by garimpeiros who stake temporary claims to small areas. They mine mostly with hand tools as they have done for centuries. The most impressive of these mines is the Antonio Pereira mine which is named for the bandit who went to the area in the 1600s in search of gold. The Antonio Pereira is approximately 14 km to the northeast of Ouro Preto and near a town of the same name.

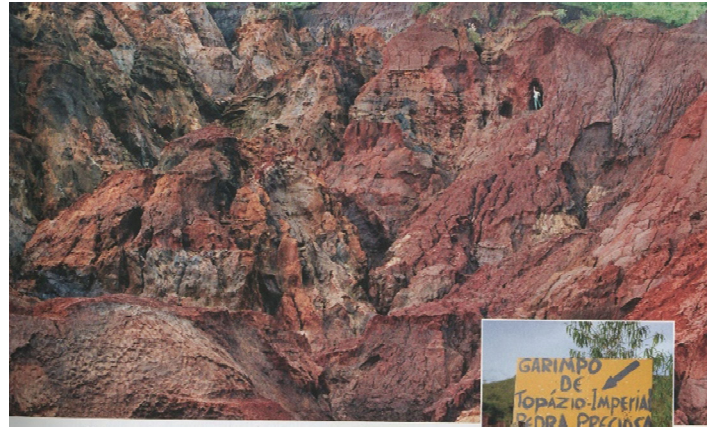


Figure 21. Antonio Pereira. Note the person standing in a dug-out area in the upper right

The miners at Antonio Pereira typically mine after the rainy season in Brazil which exposes new areas to search. They stake their claims and sell directly to visitors of the area or dealers from Ouro Preto.



Figure 22. Antonio Pereira mine.



Figure 22. Antonio Pereira mine. Looking down into the mine



Figure 23. Yellow and orange topaz on matrix. Unknown collection



Figure 24. Wine colored topaz. Unknown collection



Figure 25. Imperial Topaz specimens and cut stones of the Smithsonian collection



Figure 26. Iconic specimen of a rare gem orange topaz on a quartz crystal. Unknown collection

Major Topaz Collections

Barry Yampol (his collection is largely unseen)

Smithsonian

Ouro Preto Escola do Minas

References

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Mineralogical Record: Topaz. Jan-Feb 1995 Vol 26 (1)

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Cornejo, Carlos and Bartorelli, Andrea. Minerals and Precious Stones of Brazil. Solaris 2010 pp 566-575

Mindat.org: Ouro Preto, Vermelhao, and Capao Locality Information and Picture



Figure 27. Amazing display of wine colored imperial topaz crystals and cut stones. From an exhibit at Tuscon in the early 2000s. Photo by Buena Vista Gem Works