## SGG Zentralkurs | June 2023

# | NEWS FROM SSEF

## with a focus on East Africa

Presentation by PD Dr. Michael S. Krzemnicki

# Contents

- Corundum: Colour centres, Irradiation treatment and low-Temperature treatment
- Paraiba tourmaline
- Spinel
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- News

Corundum varieties

# Colour Centres in Corundum: Tenebrescence

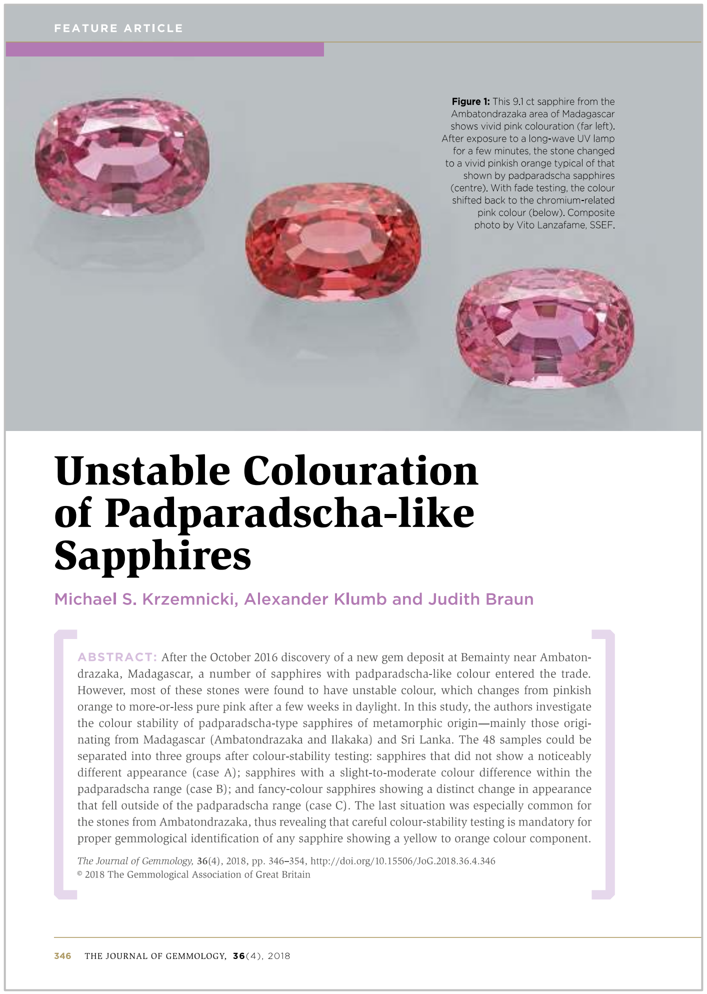
FEATURE ARTICLE

Figure 1: This 9.1 ct sapphire from the Ambatondrazaka area of Madagascar shows vivid pink colouration (far left). After exposure to a long-wave UV lamp for a few minutes, the stone changed to a vivid pinkish orange typical of that shown by padparadscha sapphires (centre). With fade testing, the colour shifted back to the chromium-related pink colour (below). Composite photo by Vito Lanzafame, SSEF.

**Unstable Colouration of Padparadscha-like Sapphires**

Michael S. Krzemnicki, Alexander Klumb and Judith Braun

ABSTRACT: After the October 2016 discovery of a new gem deposit at Bemainty near Ambatondrazaka, Madagascar, a number of sapphires with padparadscha-like colour entered the trade. However, most of these stones were found to have unstable colour, which changes from pinkish orange to more-or-less pure pink after a few weeks in daylight. In this study, the authors investigate the colour stability of padparadscha-type sapphires of metamorphic origin—mainly those originating from Madagascar (Ambatondrazaka and Ilakaka) and Sri Lanka. The 48 samples could be separated into three groups after colour-stability testing: sapphires that did not show a noticeably different appearance (case A); sapphires with a slight-to-moderate colour difference within the padparadscha range (case B); and fancy-colour sapphires showing a distinct change in appearance that fell outside of the padparadscha range (case C). The last situation was especially common for the stones from Ambatondrazaka, thus revealing that careful colour-stability testing is mandatory for proper gemmological identification of any sapphire showing a yellow to orange colour component.

*The Journal of Gemmology,* **36**(4), 2018, pp. 346–354, http://doi.org/10.15506/JoG.2018.36.4.346
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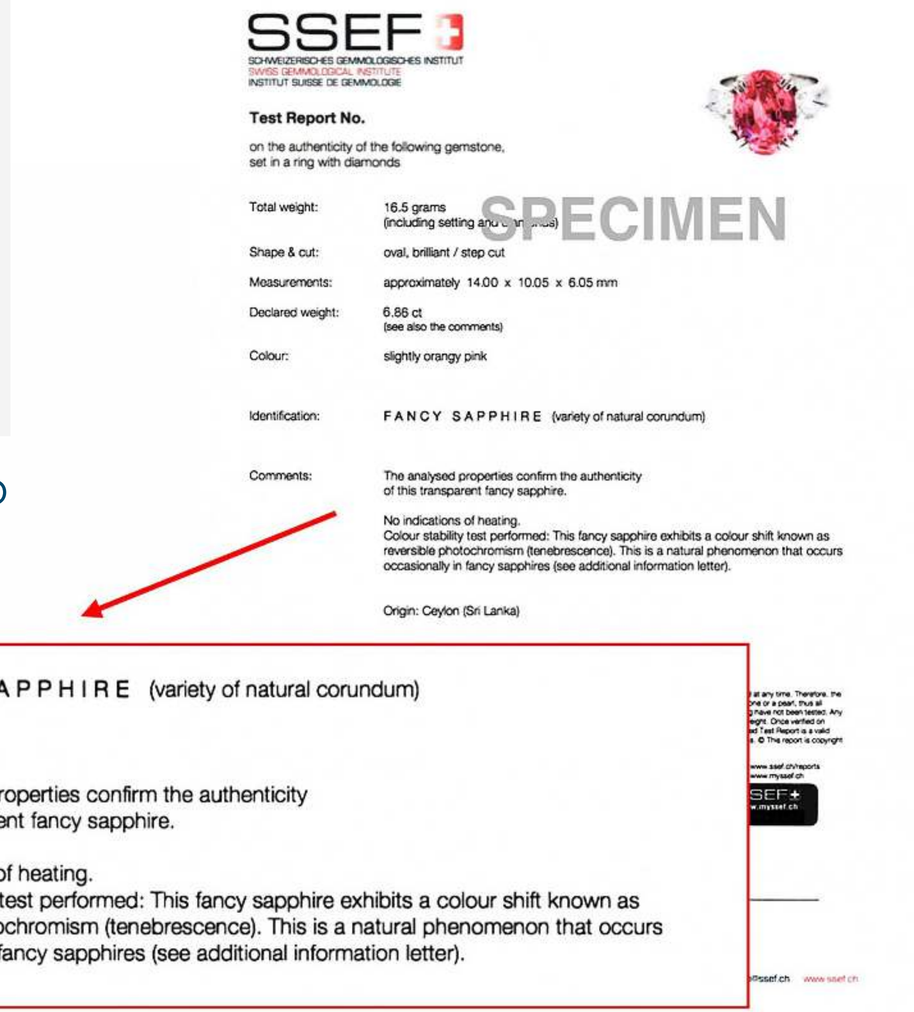
346 THE JOURNAL OF GEMMOLOGY, **36**(4), 2018


Colour centres in corundum, specifically important for yellow, orange and padparadscha-like colours.

Not all of these colour centres are stable. Thus the colour may shift over time, but also be activated by exposing the stone to an appropriate radiation.

# Colour Centres in Corundum: Reversible Photochromism (Tenebrescence)

Since March 2022: New wording to describe this colour shifting!



SSEF

SCHWEIZERISCHES GEMMOLOGISCHES INSTITUT
SWISS GEMMOLOGICAL INSTITUTE
INSTITUT SUISSE DE GEMMOLOGIE

**Test Report No.**

on the authenticity of the following gemstone, set in a ring with diamonds

SPECIMEN

| | |
|---|---|
| Total weight: | 16.5 grams (including setting and diamonds) |
| Shape & cut: | oval, brilliant / step cut |
| Measurements: | approximately 14.00 x 10.05 x 6.05 mm |
| Declared weight: | 6.86 ct (see also the comments) |
| Colour: | slightly orangy pink |
| Identification: | FANCY SAPPHIRE (variety of natural corundum) |
| Comments: | The analysed properties confirm the authenticity of this transparent fancy sapphire. No indications of heating. Colour stability test performed: This fancy sapphire exhibits a colour shift known as reversible photochromism (tenebrescence). This is a natural phenomenon that occurs occasionally in fancy sapphires (see additional information letter). Origin: Ceylon (Sri Lanka) |

Identification: FANCY SAPPHIRE (variety of natural corundum)

Comments: The analysed properties confirm the authenticity of this transparent fancy sapphire.

No indications of heating.
Colour stability test performed: This fancy sapphire exhibits a colour shift known as reversible photochromism (tenebrescence). This is a natural phenomenon that occurs occasionally in fancy sapphires (see additional information letter).

# Irradiation Treatment of Corundum


Photos and Experiment: © T. Leelawatanasuk, GIT Thailand

Since about two years, we have reliable information that rubies of purplish red tint (e.g. from Mozambique) and purplish-pink sapphires (e.g. from Madagascar) are treated by a small number of individuals using cancer radiotherapy equipment.

This irradiation treatment may induce and/or activate colour centres in corundum that result in a shift to a more attractive red or pink hue.

Usually, the colour is not fully stable, thus shifting back at least partially or fully after irradiation.

# Irradiation Treatment of Corundum

Since many years, the SSEF tests the colour stability of yellow, orange and padparadscha coloured corundum.

**New additional test at SSEF for the colour stability of rubies**

Date : 01/03/2022

Category : Research

In light of information gathered over the past few months, we have now added rubies to this colour stability testing protocol, specifically but not limited to rubies originating from Mozambique....

READ MORE

see: www.ssef.ch/news

In March 2022, we informed our clients about this new treatment and that we expanded the colour stability testing to certain rubies.

To better understand this treatment and to find criteria for detection, we started a research project including irradiation experiments using a linear accelerator in Switzerland.

THIS IS NEXT.

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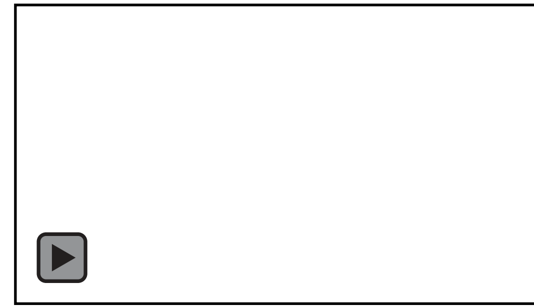
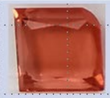
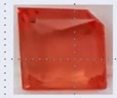
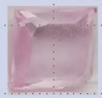
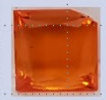
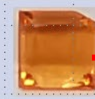
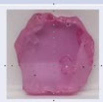
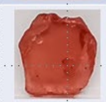
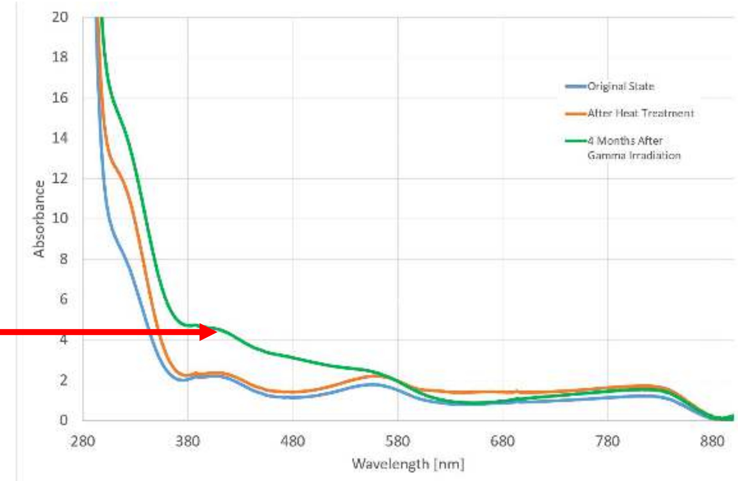
# Irradiation Experiments with Gemstones

We collaborate for this with a specialised Swiss institution (SNRC).



# Irradiation Experiments with Gemstones

| Sample | Original | Heated at 1200°C for 10h | Right after 10k Gy Gamma Irradiation | 4 months after Gamma Irradiation |
|---|---|---|---|---|
| Sample #1 Pink Fancy Sapphire |  | No heat |  |  |
| Sample #2 Pink Fancy Sapphire |  |  |  |  |
| Sample #3 Light Pink Fancy Sapphire |  |  |  |  |
| Sample #4 Purplish Pink Fancy Sapphire |  |  |  |  |




Distinct colour change after irradiation in pink to purple sapphires, most were not stable.

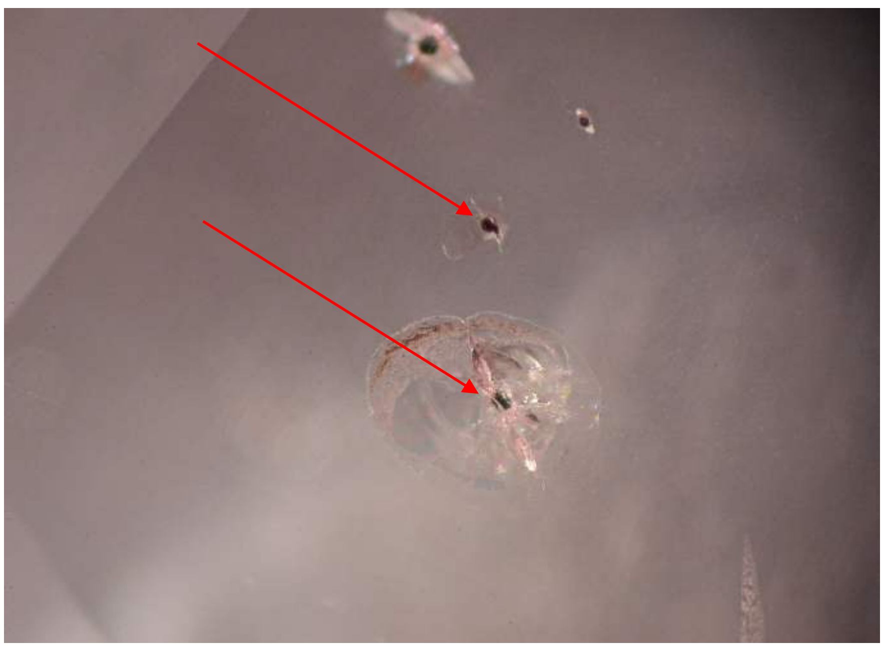
But **no colour shift** in all our **Mozambique rubies of saturated red colour** after irradiation (in accordance with findings of other labs).

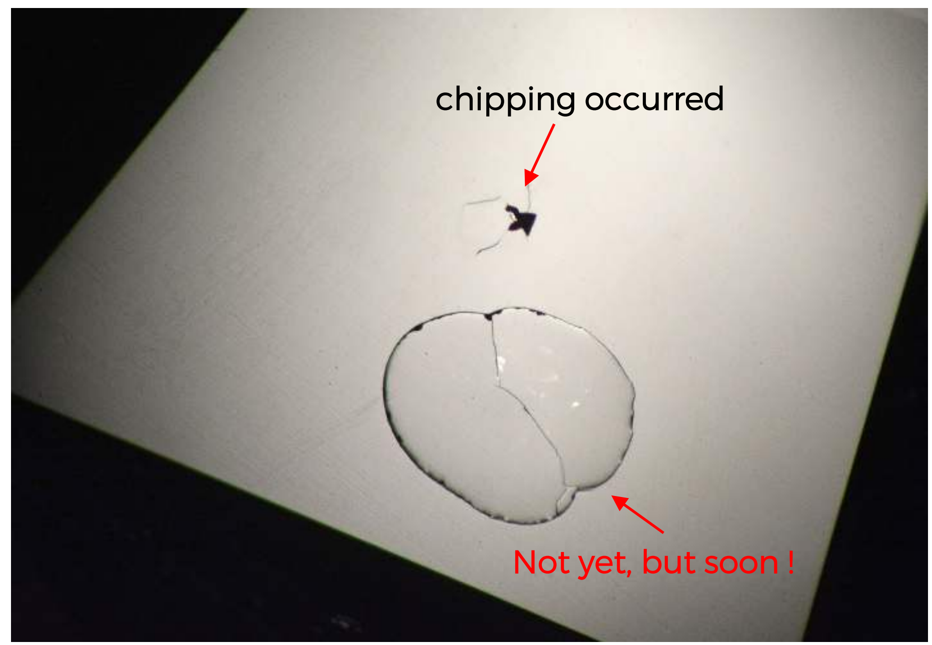
# Irradiation Treatment: Current Status of Research

- Irradiation treatment of corundum is known since many decades.
- So far, **no scientific method to positively detect this treatment**. Several gem labs (incl. LMHC) do research on this topic.
- To avoid colour shifting issues, most gem labs expand colour stability testing to include rubies, specifically if they show an orangey-red hue.
- SSEF colour stability testing on many hundred Mozambique rubies: We **never** observed a ruby with colour instability.
- Although not a proof, that such a ruby was not irradiated, it confirms at least that its colour is stable !
- All saturated red rubies irradiated by SSEF and other labs did not show any noticeable colour shift. We assume that this irradiation treatment is mostly successful for purplish red to purplish pink corundum of medium to low saturation.

# Natural Irradiation Damage

Thorianite ($ThO_2$) or other radioactive inclusion near the surface may result in a (small) chipping damage as a consequence of the decay of U to Pb over (geological) time periods.





# Low-Temperature heating of Corundum

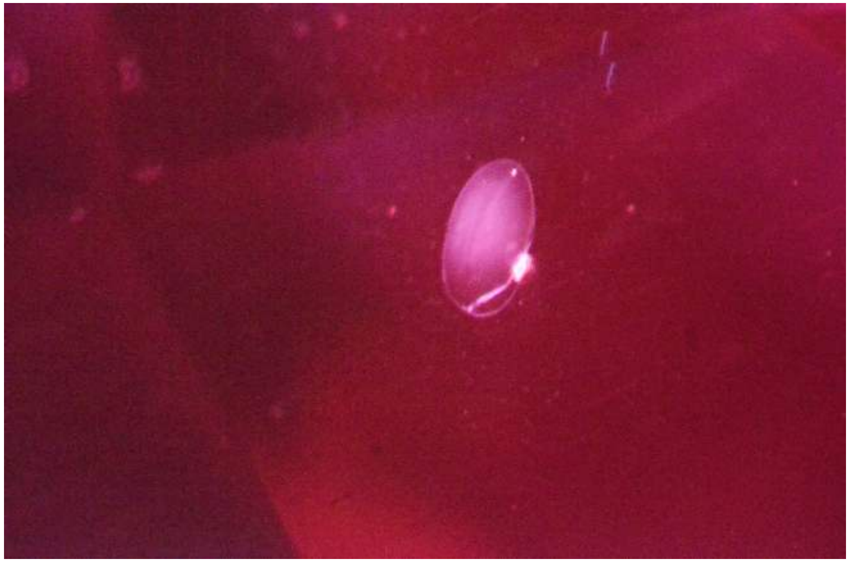
Heating of corundum:

- Traditionally at about 1200-1400 ˚C to enhance colour significantly. Inclusions (e.g. rutile needles, zircon) are mostly transformed.
- At higher temperatures (>1500 ˚C) commonly for diffusion treatment or artificially healing of fissures using a (borax) flux.
- At about 700 - 1000 ˚C (referred to as low-T heating in the trade). Inclusions may remain intact and usually only minor colour enhancement of the stone.

# Classic Detection

Characteristic atoll-structure

50x magnification, easy to see

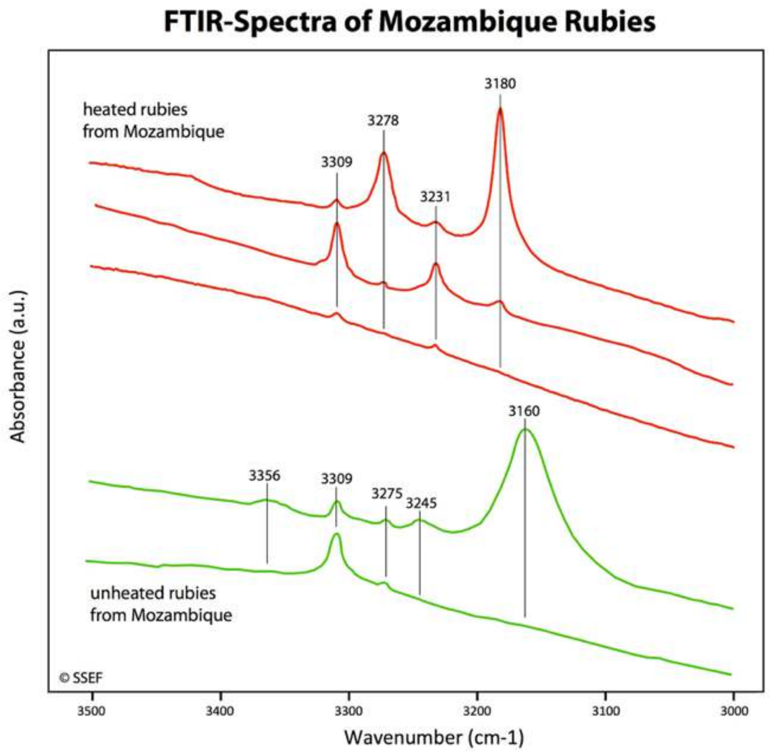


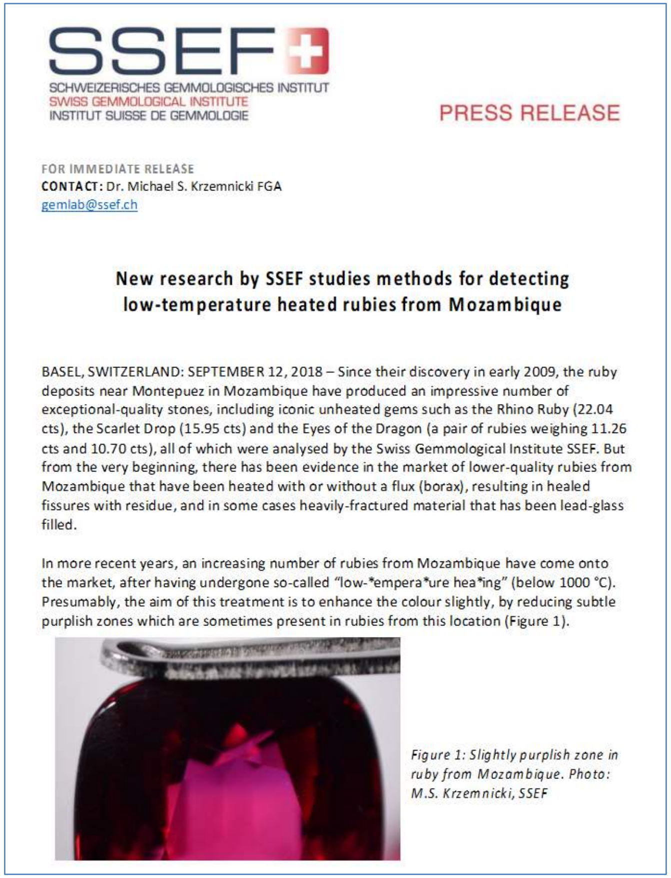
Characteristic atoll-structure

70x magnification, difficult to see

Such evident features for heating are rarely seen in corundum heated at low temperatures.

# FTIR spectroscopy



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PRESS RELEASE

FOR IMMEDIATE RELEASE
**CONTACT:** Dr. Michael S. Krzemnicki FGA
gemlab@ssef.ch

**New research by SSEF studies methods for detecting low-temperature heated rubies from Mozambique**

BASEL, SWITZERLAND: SEPTEMBER 12, 2018 – Since their discovery in early 2009, the ruby deposits near Montepuez in Mozambique have produced an impressive number of exceptional-quality stones, including iconic unheated gems such as the Rhino Ruby (22.04 cts), the Scarlet Drop (15.95 cts) and the Eyes of the Dragon (a pair of rubies weighing 11.26 cts and 10.70 cts), all of which were analysed by the Swiss Gemmological Institute SSEF. But from the very beginning, there has been evidence in the market of lower-quality rubies from Mozambique that have been heated with or without a flux (borax), resulting in healed fissures with residue, and in some cases heavily-fractured material that has been lead-glass filled.

In more recent years, an increasing number of rubies from Mozambique have come onto the market, after having undergone so-called “low-*empera*ure hea*ing” (below 1000 °C). Presumably, the aim of this treatment is to enhance the colour slightly, by reducing subtle purplish zones which are sometimes present in rubies from this location (Figure 1).

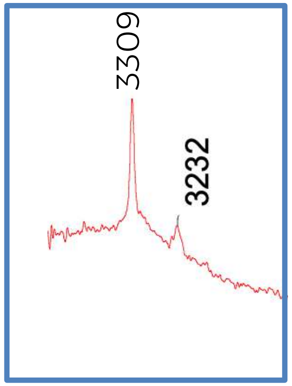
*Figure 1: Slightly purplish zone in ruby from Mozambique. Photo: M.S. Krzemnicki, SSEF*

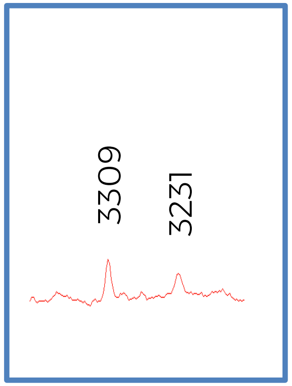
SSEF Press Release Sept 2018
See https://www.ssef.ch/press-releases/

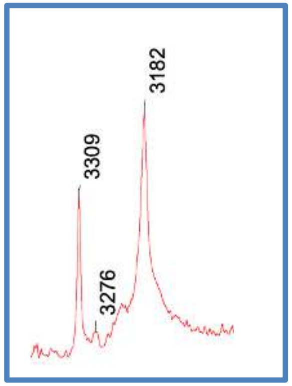
# FTIR spectroscopy

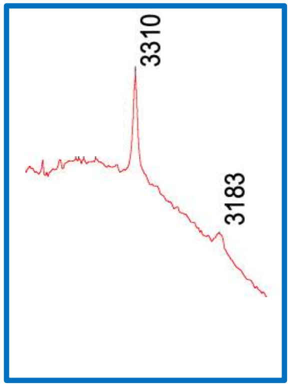
## Heated Mozambique Rubies:
## Samples from Gemfields (heated by Gemfields) and the Bangkok trade.

**Simple OH-series (only 2 peaks)**

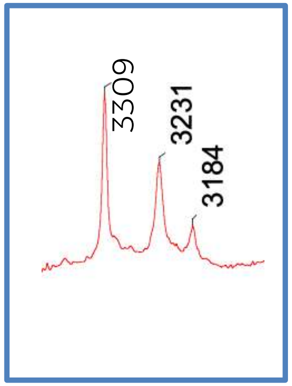


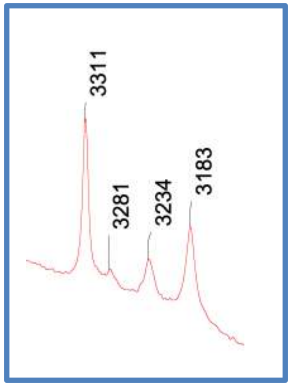



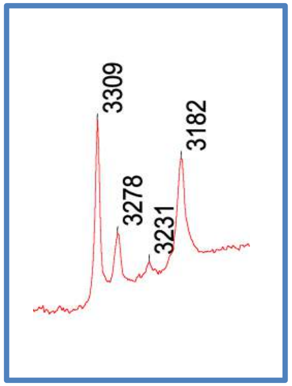



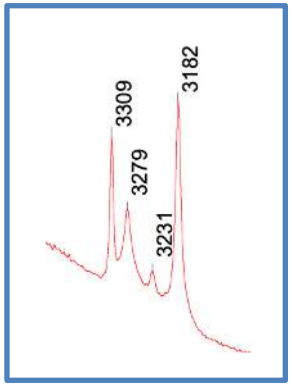



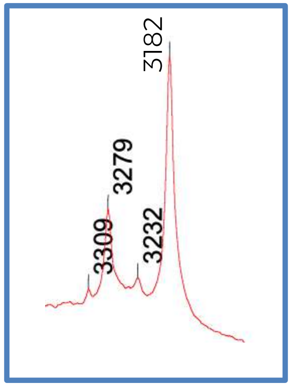

**Complex OH-series (3 or more peaks)**



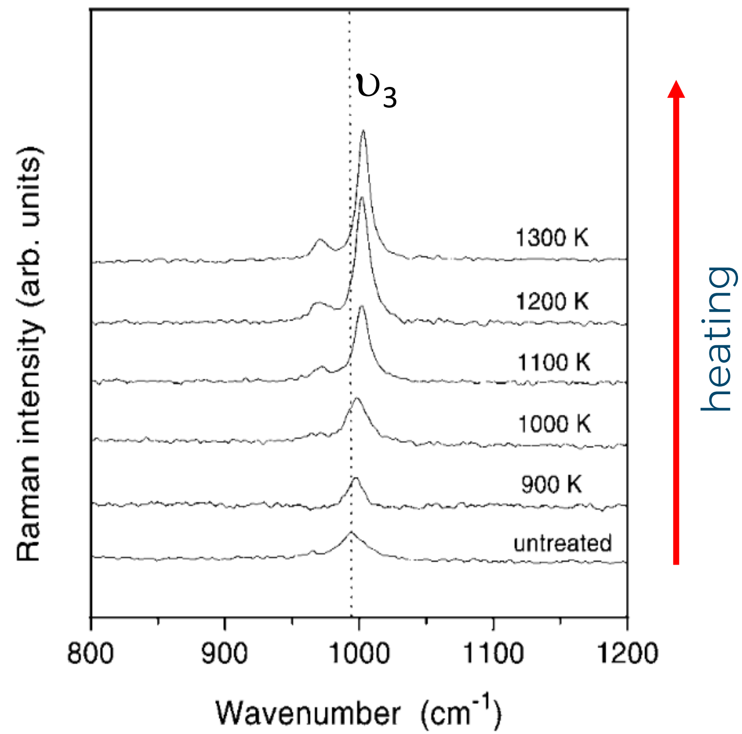



# Raman spectroscopy

Zircon inclusions may provide important information about heat treatment (and origin) of corundum.

*"Hot" pink sapphire from Ilakaka (Madagascar) and small zircon inclusions in such a pink sapphire.*

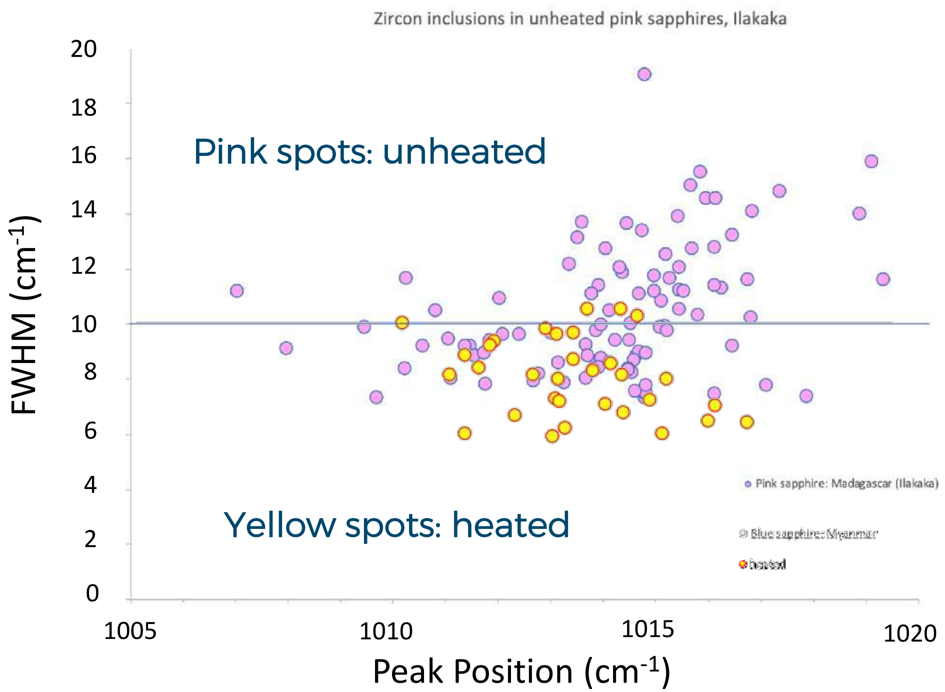



Spectra of zircon 4604 (dose = $3.5 \times 10^{18}$ $\alpha$-events $g^{-1}$) annealed at different temperatures for one hour.

Zhang *et al. 2000*

# Raman spectroscopy

$\upsilon_3$ versus FWHM($\upsilon_3$) scatterplot




ONLINE INTERNATIONAL GEMMOLOGICAL CONFERENCE

IGC 2021

20 - 21 November 2021

**Zircon inclusions in unheated pink sapphires from Ilakaka, Madagascar: A Raman spectroscopic study**

**M.S. Krzemnicki, P. Lefèvre, W. Zhou, H.A.O. Wang**
**Swiss Gemmological Institute SSEF**
**gemlab@ssef.ch**

Since its discovery in 1998, the secondary gem deposit of Ilakaka, southwestern Madagascar has produced a large number of outstanding stones for the gem trade, notably sapphires and fancy sapphires in a wide range of colours (Milisenda et al. 2001). Until today, pink sapphires from Ilakaka are found in great numbers in the trade, often characterised by an outstanding quality and a pastel pink to vivid pink ("hot pink") colour.

Interestingly, pink sapphires from Ilakaka commonly contain numerous rounded zircon inclusions, sometimes even clustered in aggregates (Figure 1). Zircon is found in corundum from many different geological settings and geographic origins and may provide crucial information for gem testing, both, regarding heat treatment (Wang et al. 2006, Krzemnicki 2010, Saeseaw et al. 2020) and origin determination (Xu & Krzemnicki 2021).

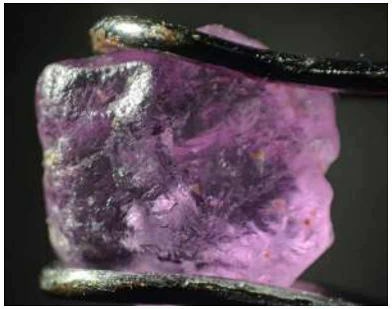
The Raman analysis of zircon inclusions in pink sapphires from Ilakaka (Madagascar) is widely used in gem labs as a routine test as it may provide supporting analytical evidence of a heat treatment. In this study, we focus on Raman spectra of zircon inclusions in unheated pink to purplish pink sapphires from Ilakaka to better characterise and understand the range and variability of the $SiO_4$-related bandwidths. More than 100 zircon inclusions in 28 samples (rough and cut) from the SSEF research collection were analysed using an InVia Renishaw Raman microprobe coupled with a 514 nm argon-ion laser. In accordance with literature (Nasdala et al. 1995, Wang et al. 2006, Saeseaw et al. 2020) we focussed on the main Raman peak u3 ($SiO_4$ anti-symmetrical stretching mode) of zircon at about 1010 $cm^{-1}$ as a measure of its crystallinity (or degree of metamictization). From these spectra we determined the u3 bandwidth (FWHM: Full-Width-Half-Maximum) by fitting into a software-integrated Gaussian-Lorentzian function after baseline correction.

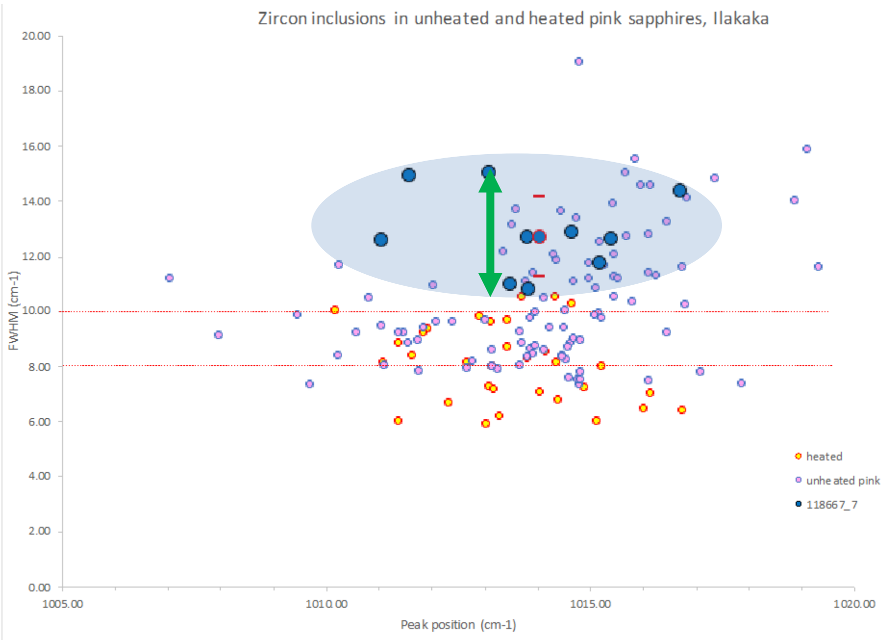
Our results of all analysed zircon inclusions in unheated samples show a large variation of u3 peak position and bandwidth not only in different pink to purple sapphires, but even in neighbouring zircon inclusions within the same specimen (Figure 2). Interestingly, we also found peak variations when measuring several different positions of selected single zircon inclusions. The FWHM of u3 in our unheated samples range between 7.5 to 17.6 $cm^{-1}$, with a median value of below 10. Similar results have been described by Wanthanachaisaeng (2006, 2007). Our analyses in unheated rough and cut pink sapphires from Ilakaka, however, reveal bandwidth values distinctly lower than those reported by Wang et al. (2006) and Saeseaw et al. (2020) in their samples. Our results show, that heat treatment detection of pink sapphires from Madagascar based on Raman spectra of zircon inclusions alone needs to be applied cautiously to avoid misinterpretations.

Large overlap of unheated and heated pink sapphires from Ilakaka (Madagascar).

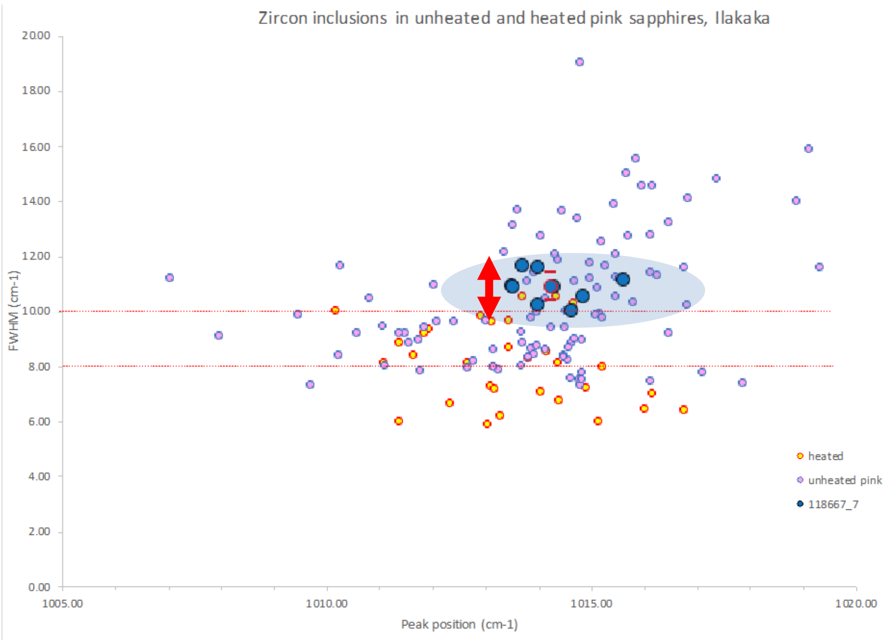
# Raman spectroscopy

Heating experiment (1000 °C) of pink sapphire, Madagascar with numerous zircon inclusions.






FWHM of zircons before

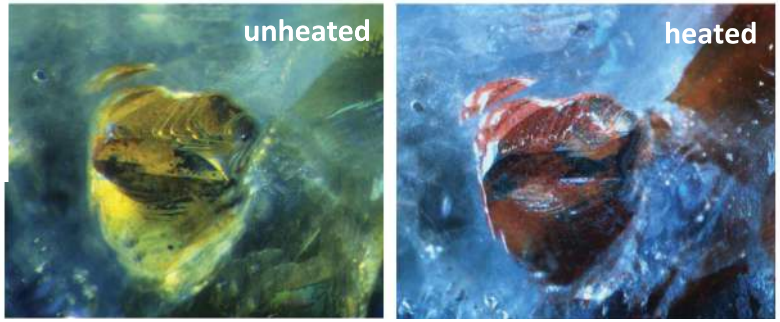



FWHM of zircons after heating

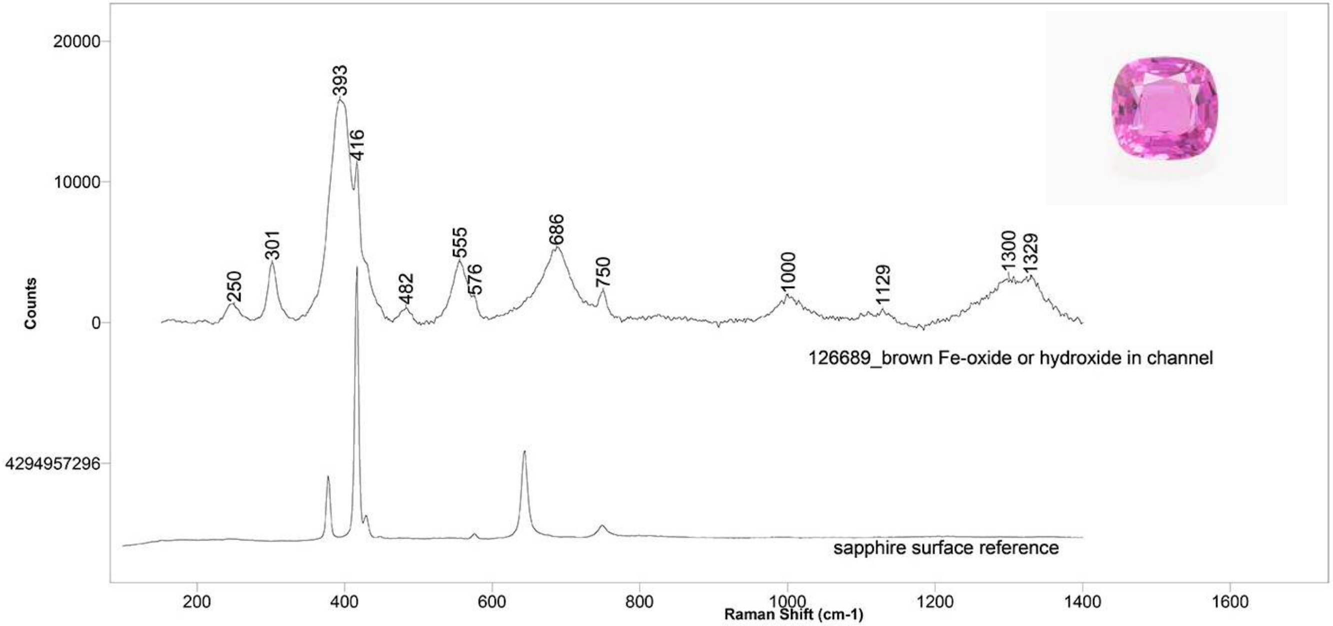
# Raman spectroscopy

Goethite (Fe-hydroxide), diaspore (Al-hydroxide), and other inclusion minerals as important markers for unheated corundum!

*Figure 2. Left: This Sri Lankan sapphire hosts a blocky iron sulfide inclusion with a surface-reaching crack, both of which are coated with yellow limonite. Right: After heating in air to 350°C, the limonite coating on both the sulfide and the related fracture changed to rust-colored hematite. Photomicrographs by J.I. Koivula; magnified 10×.*




from Koivula 2013



# Raman spectroscopy

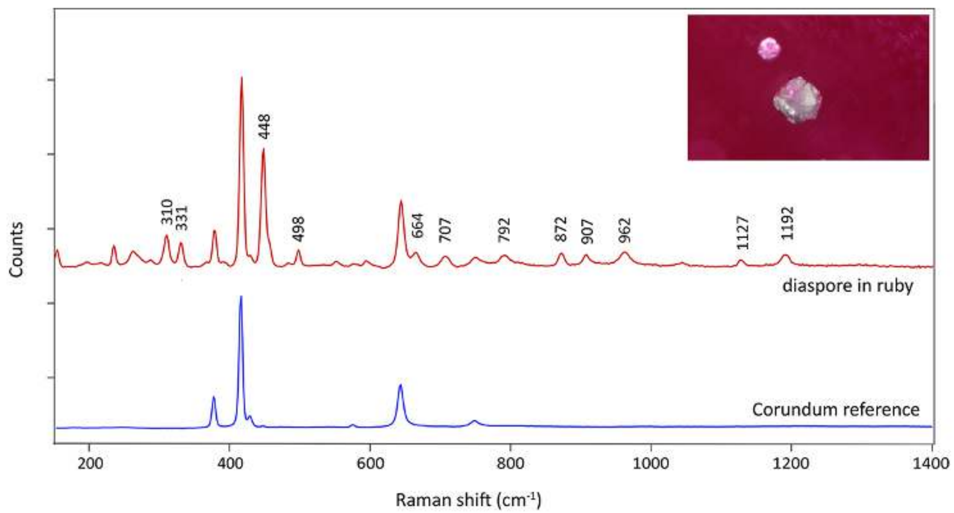
Goethite (Fe-hydroxide),
diaspore (Al-hydroxide),
and other inclusion minerals
as important markers for
unheated corundum!

SSEF Newsletter
March 2023
https://www.ssef.ch/ssef-news/

2023

New and additional criteria to detect low-T heated pink sapphires applied by SSEF

Heat treatment of ruby, sapphire and other colour varieties of corundum is one of the main issues for the gem trade. As such, detecting such treatment is a major task of gemmological laboratories issu...




**37TH IGC CONFERENCE**

IGC 2023: 23 -27 OCTOBER IN TOKYO, JAPAN

**PHASE TRANSFORMATIONS AS IMPORTANT MARKERS FOR HEAT TREATMENT DETECTION IN CORUNDUM AND OTHER GEMSTONES**

Michael S. Krzemnicki[1,2], Pierre Lefèvre[1], Wei Zhou[1]

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**Keywords: Heat treatment, diaspore, goethite, dehydration, Raman spectroscopy**

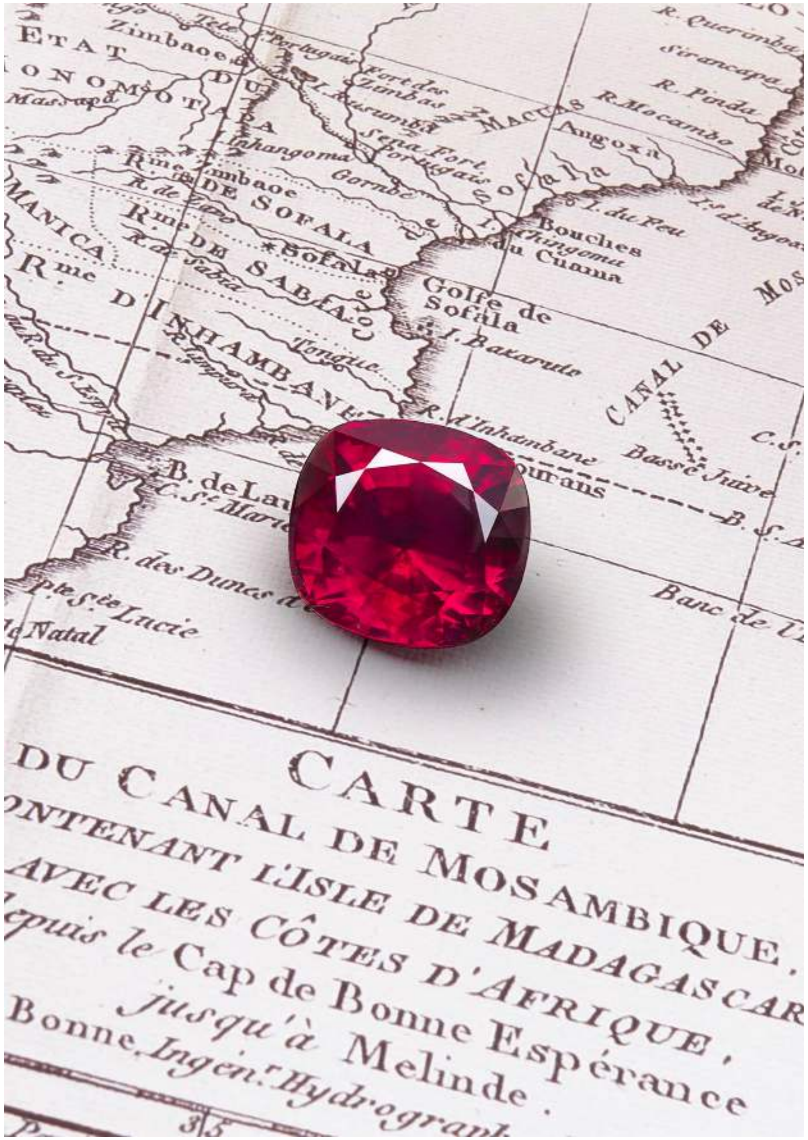
Introduction

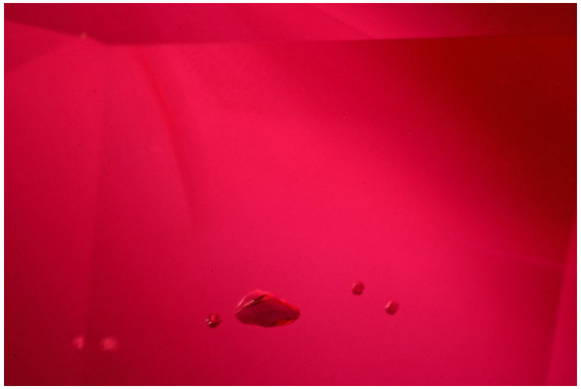
Detection of heat treatment of ruby and sapphire and other colour varieties of corundum is a major issue for the trade and laboratories alike. Heat treatment of corundum is commonly applied in a large temperature range from about 700 to 1800 °C in both, oxidizing and reducing conditions.

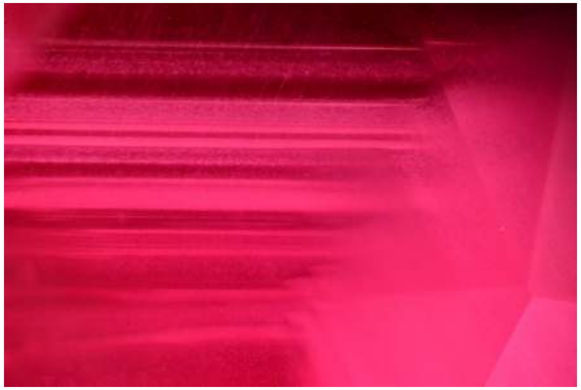
Traditionally, the detection of corundum heat treatment is based mainly on meticulous microscopic observation. As a consequence of the heating process, internal features (e.g. fluid and solid inclusions zoning features) may be affected and altered (Gübelin & Koivula 2006) and by this pro straightforward evidence of heat treatment. In general, characteristic heating features (e tension cracks around inclusions, see Figure 1) become more prominently visible with i temperature (and heating duration). Far more challenging is the microscopic detection of so-called "low-temperature" heated corundum. In these stones which are heated at about 700 °C to 1100 °C only very minute or even no alterations of inclusions may be observed under the microscope (Hughes *et al.* 2022). Another classic approach is to check for "chalky" fluorescence reactions under shortwave ultraviolet light. However, such reactions can generally only be expected at higher heating temperatures well beyond 1100 °C.

Heat treatment detection is also very much relying on FTIR and Raman spectroscopy. In FTIR, the focus is very much on the presence and intensity of $OH^-$ related absorption peaks. Namely the 3309, 3232 and 3185 $cm^{-1}$ series in metamorphic corundum is considered a strong indication for artificial heat treatment (Smith 1995; Beran & Rossman 2006; Saeseaw *et al.* 2020; Pardieu *et al.* 2015; Krzemnicki 2019). The presence or absence of a Mg-O related band at 3160 $cm^{-1}$ is another important

# Estrela de Fura 55.22 ct, Mozambique





USD 34.8 million at Sotheby's Auction, 8th of June, in New York.

New World Record for a ruby and any coloured gemstone at auction so far.

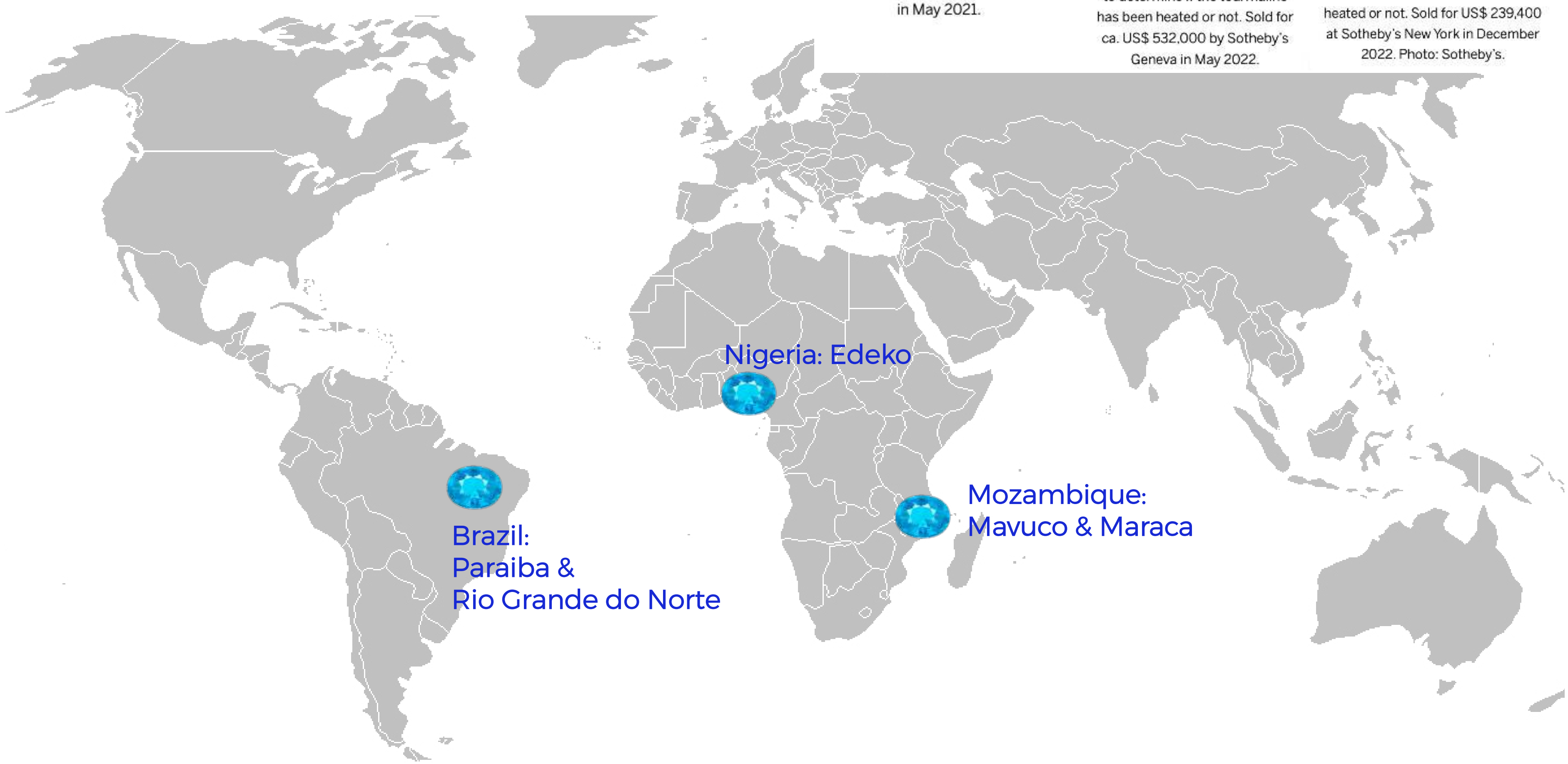
# Paraiba Tourmaline

# Paraiba Tourmaline

Paraiba tourmaline (Brazil) of 14.20 ct with indications of heating. Sold for ca. US$ 805,000 at Christie's Hong Kong in May 2021.

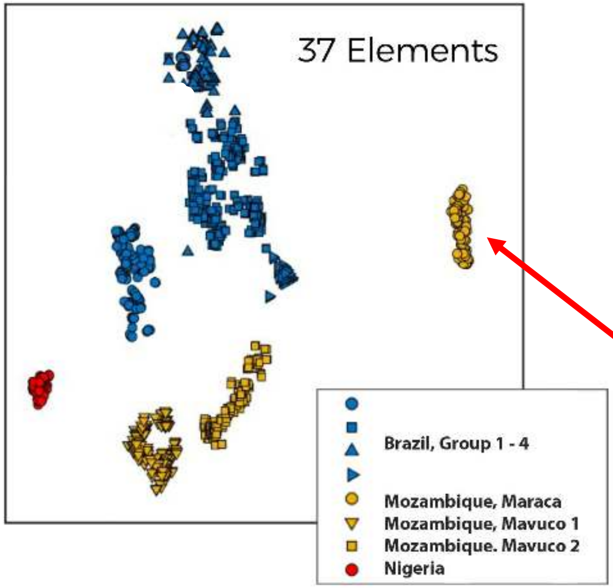
Paraiba tourmaline and diamond ring. The tourmaline weighs 21.63 ct, is of Mozambique origin and it is currently not possible to determine if the tourmaline has been heated or not. Sold for ca. US$ 532,000 by Sotheby's Geneva in May 2022.

10.13 ct copper- and manganese-bearing tourmaline from Nigeria, also called 'Paraiba tourmaline' in the trade. It is currently not possible to determine if the tourmaline has been heated or not. Sold for US$ 239,400 at Sotheby's New York in December 2022. Photo: Sotheby's.



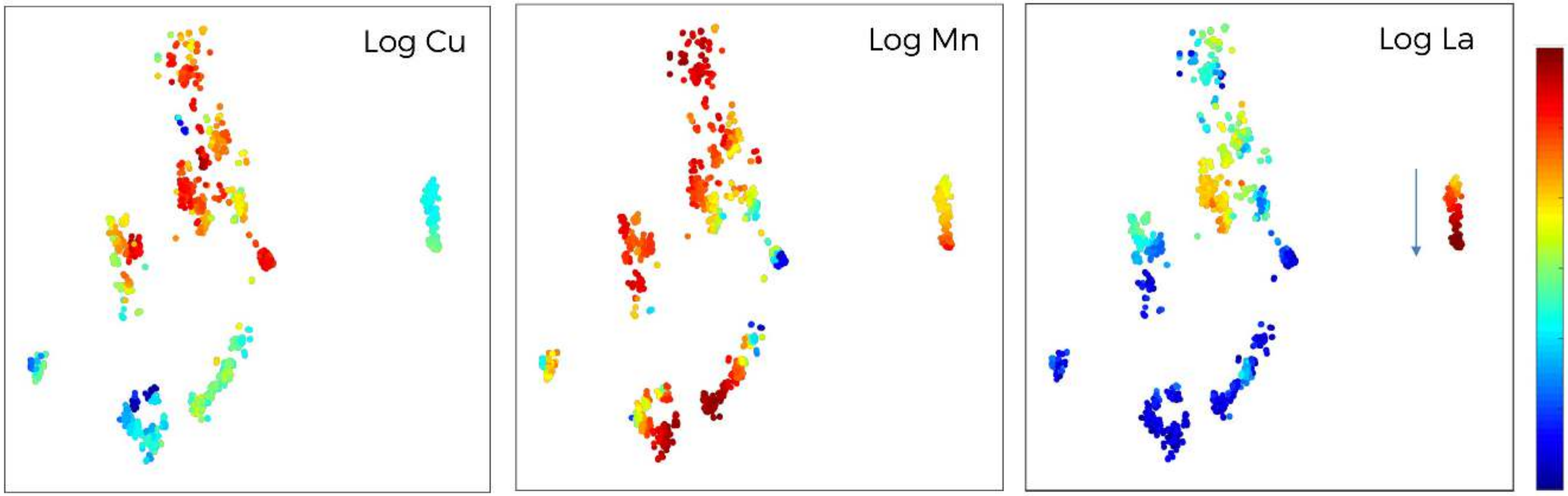

Map © Wikicommons

# Machine Learning for Paraiba Origin Determination




Data visualisation at SSEF using **machine learning algorithm** (non-linear unsupervised tSNE).

Mozambique, Maraca

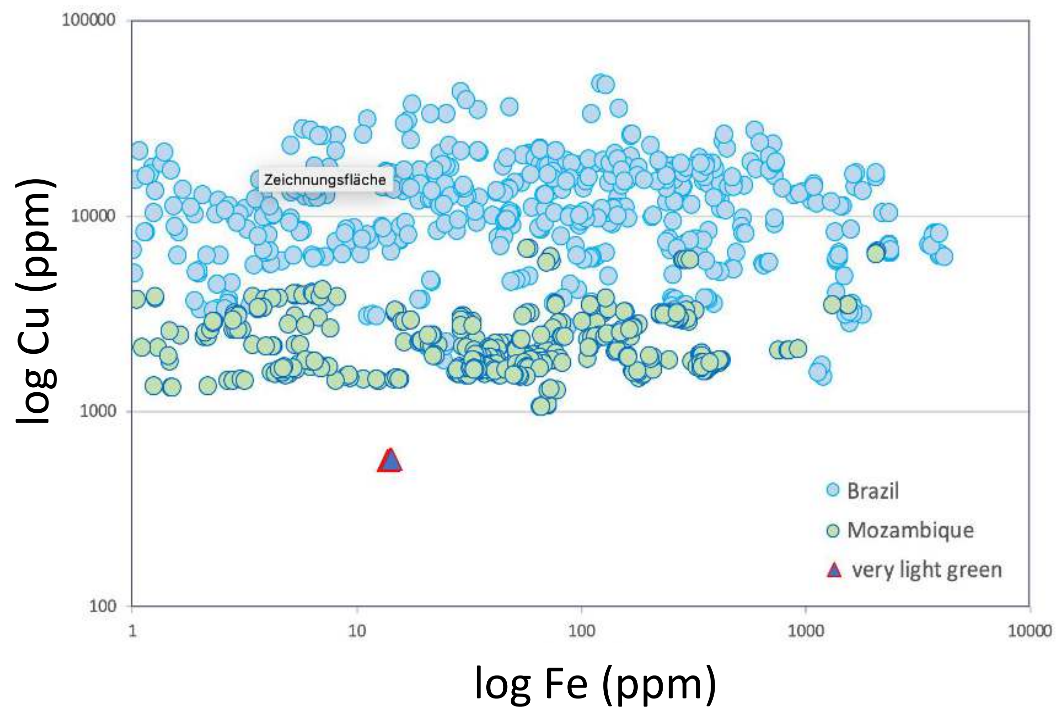


# Paraiba tourmaline or not?

Mozambique tourmaline containing low amount of copper.

Oxide weight %

| | |
|---|---|
| $Fe_2O_3$ | 0.01 |
| MnO | 3.75 |
| CuO | 0.09 |




Not considered Paraiba tourmaline!

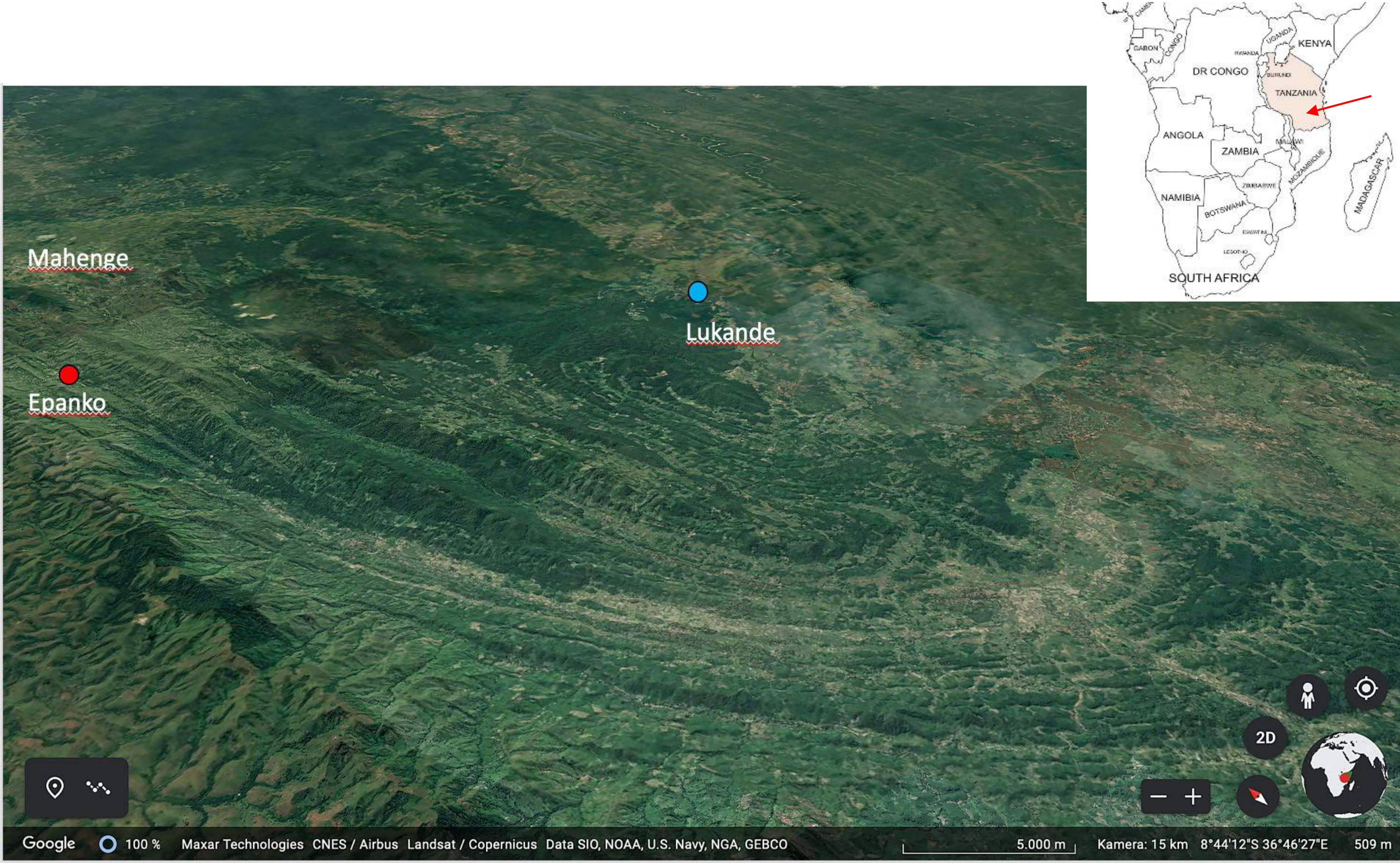
See also updated LMHC information sheet No. 6:
https://www.lmhc-gemmology.org/gemstones

# Quiz: Paraiba tourmaline or not?

Pair of tourmalines from same client tested recently at SSEF.

| Oxide weight % | | |
|---|---|---|
| $Fe_2O_3$ | 0.01 | 2.00 |
| MnO | 0.98 | 0.99 |
| CuO | 0.24 | b.d. |

# Spinels from Lukande and Epangko, near Mahenge, Tanzania



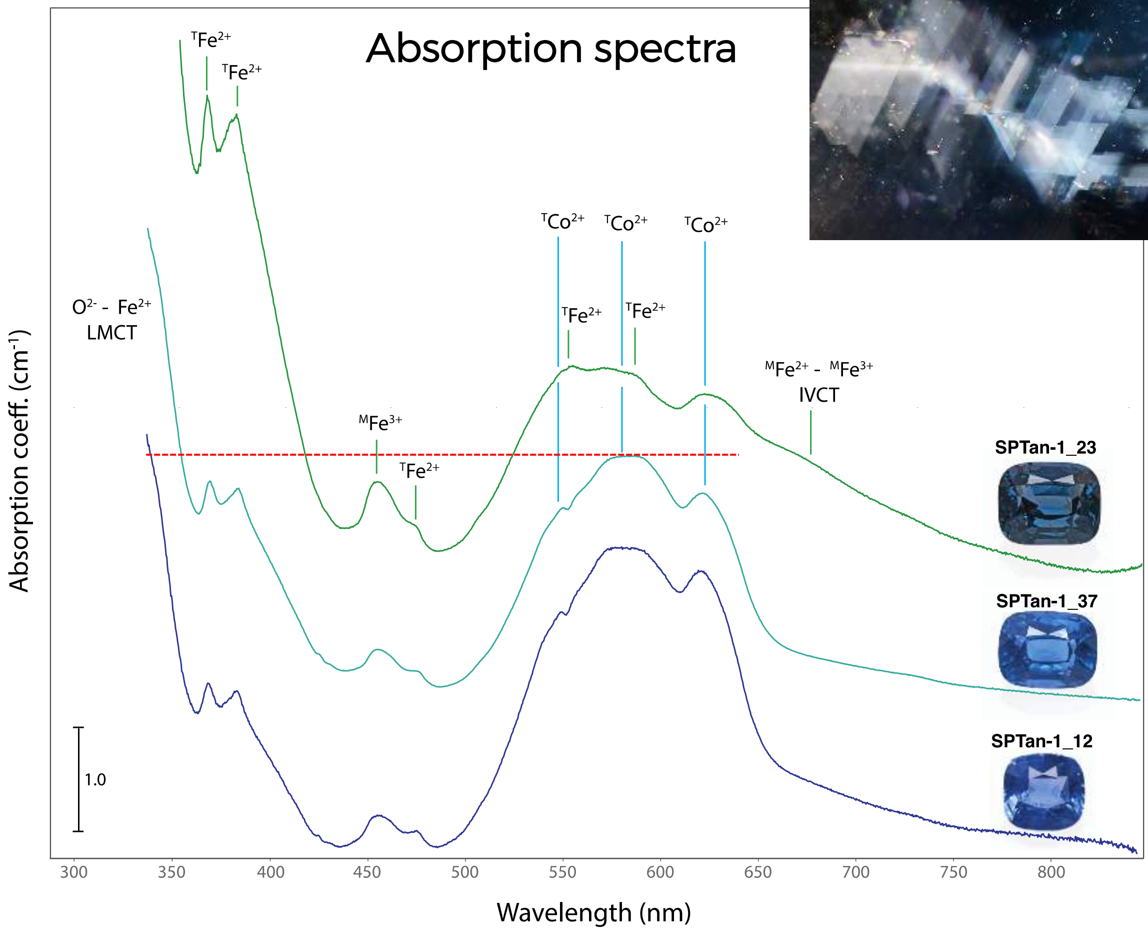
# Co-bearing Spinel from Lukande, south of Mahenge, Tanzania

Photo: A. Leuenberger, ALine GmbH


Photo: SSEF

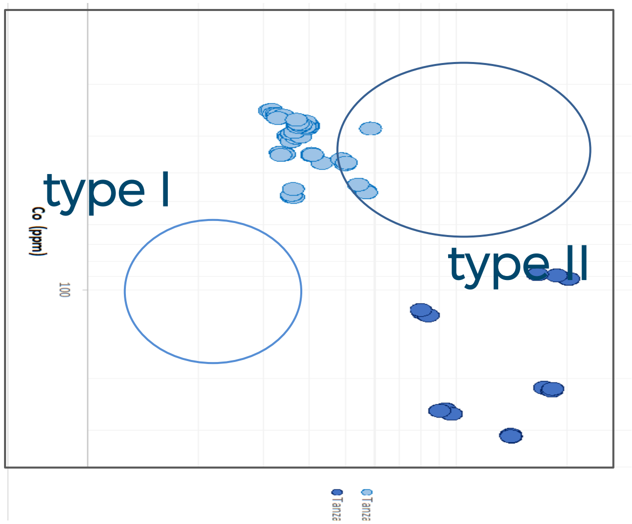
# Co-bearing Spinel from Lukande, south of Mahenge, Tanzania

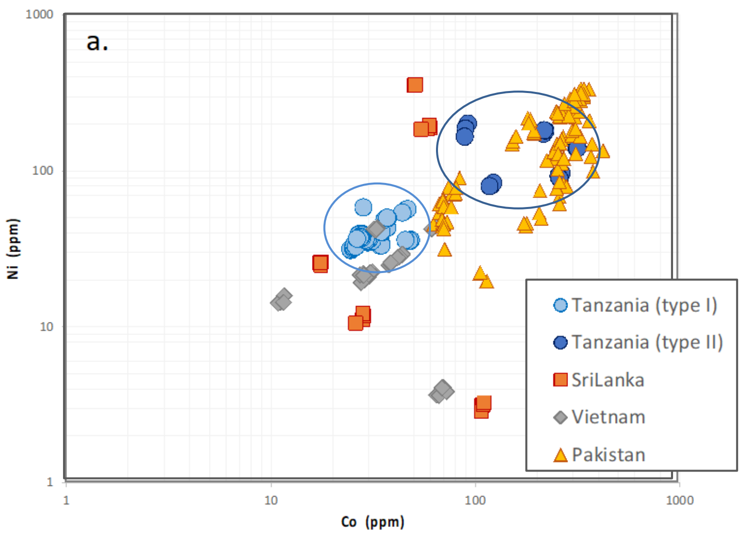
## Not all blue spinel from this new source is Co-spinel !




# Co-bearing Spinel from Lukande, south of Mahenge, Tanzania

## Trace element comparison of Co-spinel type I vs type II from Lukande




FEATURE ARTICLE

Figure 1: These gem-quality Co-bearing blue spinels (3–12 ct) come from a new deposit in the Lukande area of Tanzania. Composite photo by M. S. Krzemnicki.

# Cobalt-bearing Blue Spinel from Lukande, near Mahenge, Tanzania


Michael S. Krzemnicki, Alex Leuenberger and Walter A. Balmer



**ABSTRACT:** In September 2021, a new deposit of Co-bearing blue spinel was discovered in the Lukande area, south of Mahenge in central Tanzania. We analysed 44 faceted spinels from this source, ranging from Co-dominated blue to Fe-dominated (greyish) blue. Interestingly, nearly all of these spinels showed characteristic inclusion features, consisting predominantly of oriented rhombic lamellae (inferred to be högbomite), as well as oriented short needles and particles. In addition, trace-element analyses revealed two types of spinel from this new deposit: attractive blue stones that showed an average Co concentration of 32 ppm (designated type I), and darker material with distinctly higher Co (averaging 200 ppm; designated type II). The latter showed a beautiful blue colour only when cut into melee-sized stones (i.e. about 2 mm diameter). Based on their trace-element composition, stones from this new deposit near Lukande can be separated from Co-bearing spinels from Vietnam, Sri Lanka and Pakistan. U-Pb dating of surface-reaching zircon inclusions indicates the Tanzanian spinels formed during a late stage of the East African Orogeny, possibly overprinted by the Kuunga-Malagasy orogeny (about 500–570 million years ago).



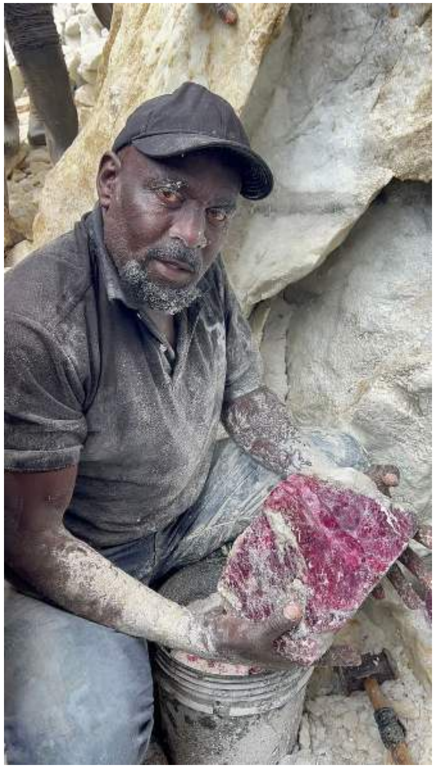
*The Journal of Gemmology*, **38**(5), 2023, pp. 474–493, https://doi.org/10.15506/JoG.2023.38.5.474



Gem-quality spinel ($MgAl_2O_4$) from Tanzania has been well known in the trade for many decades. However, until recently, fine blue Co-bearing spinel (e.g. Figure 1) was quite rare from this country. Gem-quality Tanzanian spinel was described from the Umba Valley (near the Kenyan border), and later from the Uluguru Mountains near Morogoro in the central part of the country. These spinels were mostly red to pink and purple (Bank *et al.* 1989; Hänni & Schmetzer 1991; Schmetzer & Berger 1992). Occasionally, blue spinel from the Morogoro Region has been mentioned in the literature (Schmetzer & Berger 1992) and, later, was found together with other gem varieties in alluvial deposits at Tunduru in

# New Spinel from Epangko near Mahenge, Tanzania

New production of pinkish red spinel from the “classical” deposit in Epangko, near Mahenge (Morogoro region, Tanzania.



near Mahenge,
Tanzania

# Epangko spinel deposit, near Mahenge, Tanzania

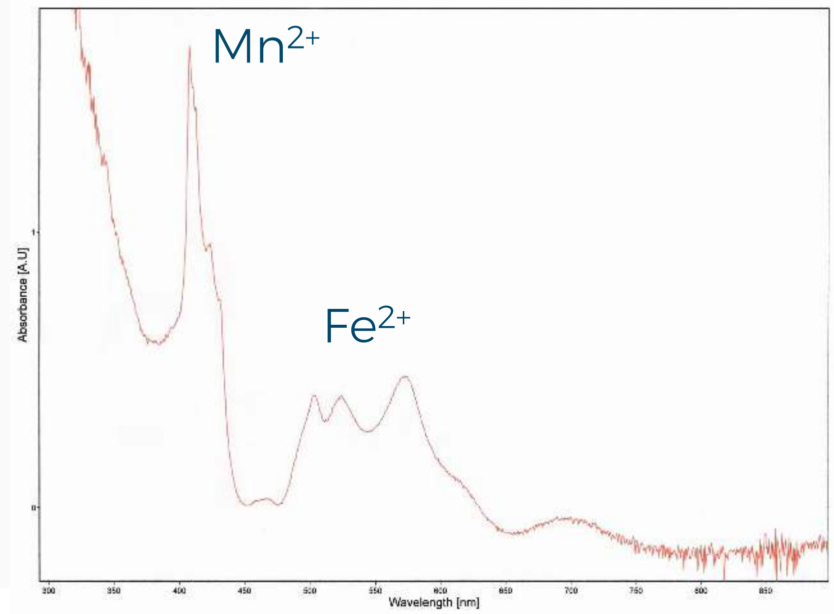
# Ant Hill Garnet (Pyrope)



Pyrope garnets from Navajo Indian Reservation, New Mexcio USA.

rough stones brought to surface by ants digging in the soil, hence their name.

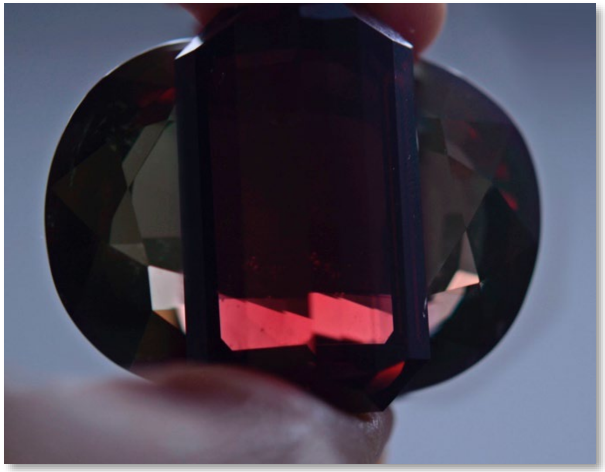
# Tanzanian Garnet with slight Colour Shift


Garnets from Tanzania with slight colour shift

Pyrope with distinct spessartine and low almandine component.

# Colour Change Garnet from East Africa

Usambara effect:
V-bearing colour change garnets from Tanzania.

Vanadium-bearing garnets of the pyrope-spessartine series may show a colour change and additionally an interesting Usambara effect.

# Alexandrite vs Chrysoberyl

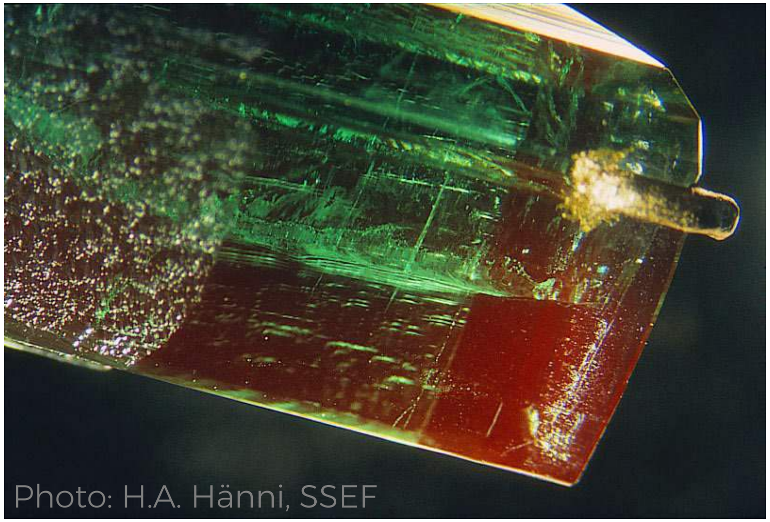
Alexandrite shows distinct pleochroism

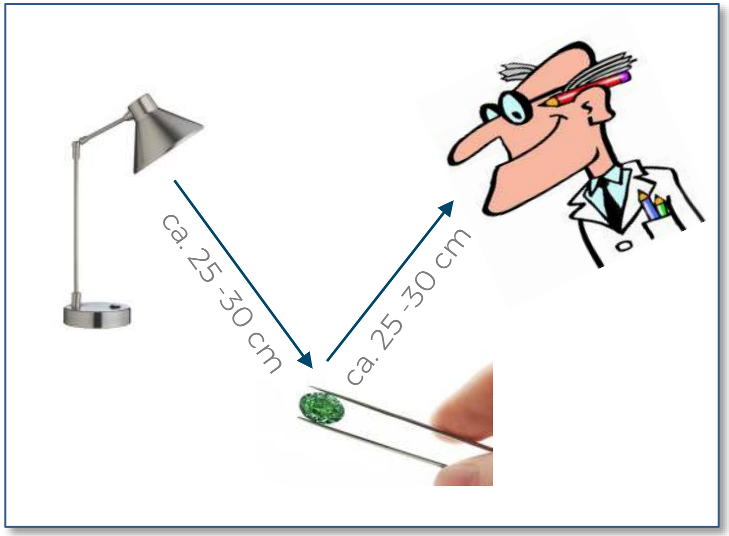
**Alexandrite** (LMHC) definition:

A chromium-bearing variety of chrysoberyl showing a colour-change in principle from a “cold” hue (e.g. greenish) in daylight to a “warm” hue (e.g. reddish-purplish) in incandescent light.

# How to check for Colour Change

Do not hold the stone directly to a strong light source to check the colour change!



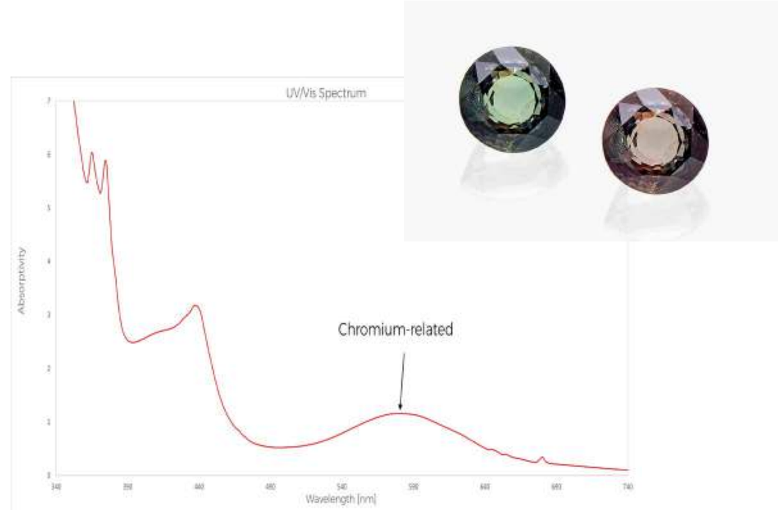



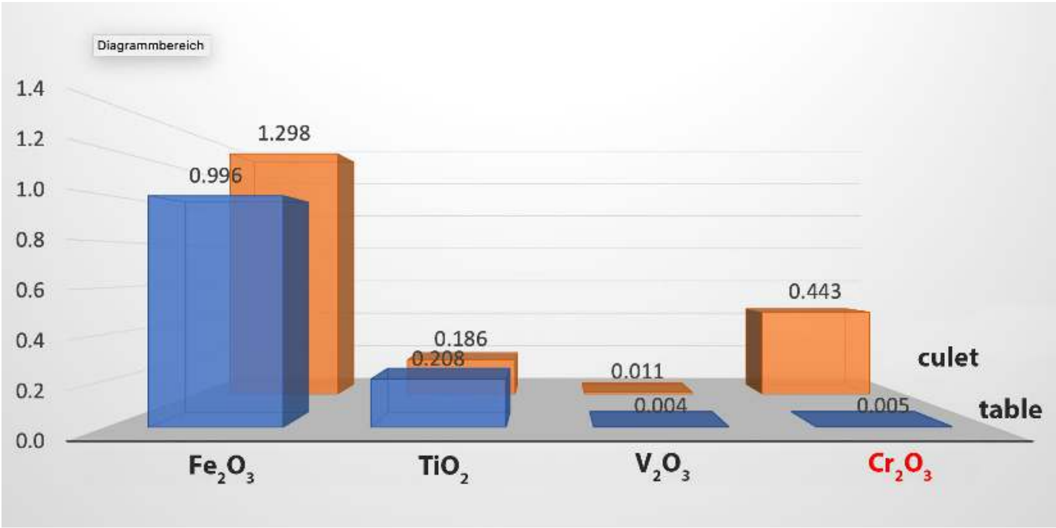

Emerald close to light source:
not a colour change!

Colour change:
Change of **main hue** when holding the stone about 30 cm from the light source (standardised daylight and incandescent light).
See also LMHC information sheet No. 9; www.lmhc-gemmology.org

# Alexandrite vs Chrysoberyl

# Zoned Alexandrite



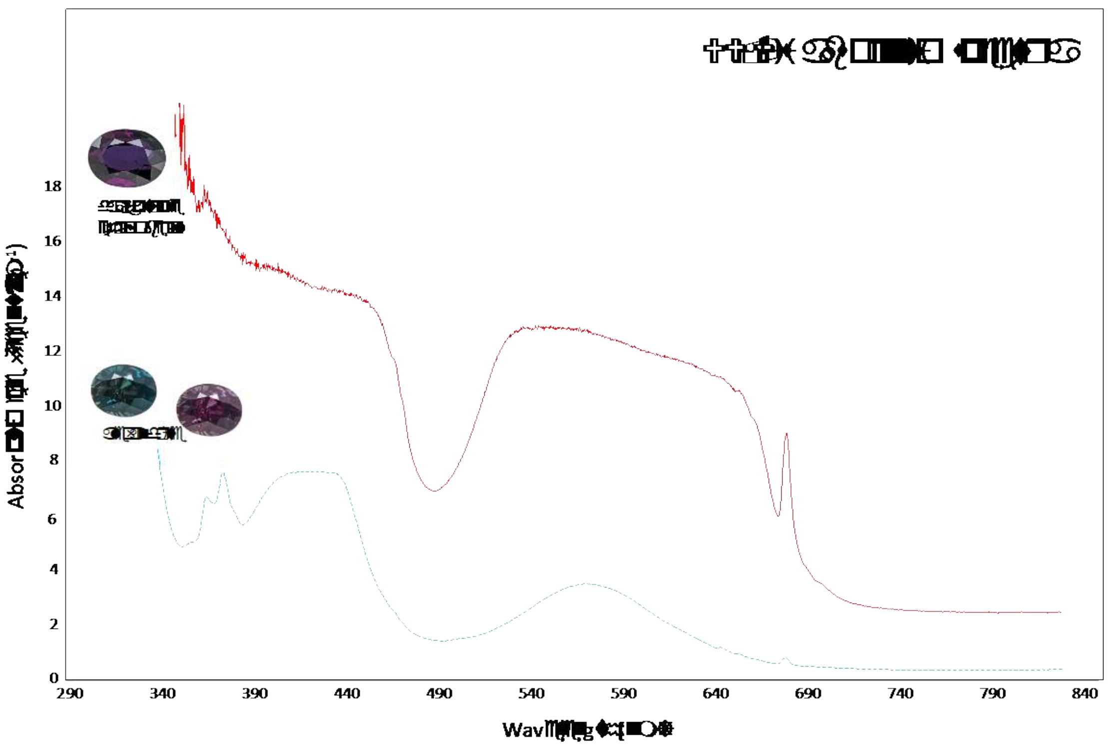

Chromium-rich zone at the culet (reddish) and chemical composition at table facet (blue bars) and culet (orange bars).

Photo: P. Lefèvre, SSEF

# Not Alexandrite !

This chrysoberyl is only dark reddish purple.

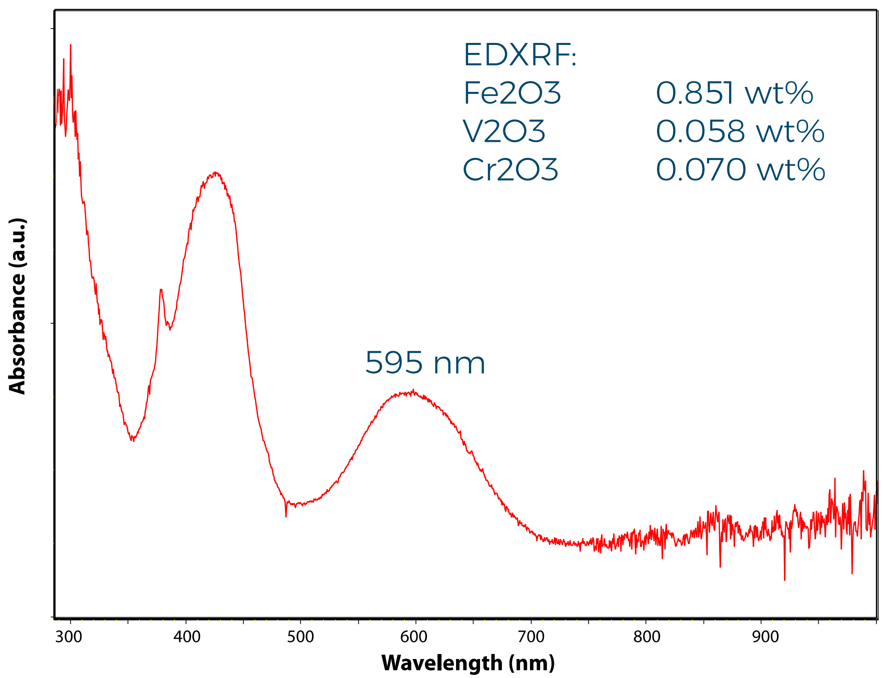
Too much chromium ($2.8$ wt% $Cr_2O_3$) for colour change!



# Not Alexandrite !

Chrysoberyl from Sri Lanka with equal vanadium and chromium concentration.
The main absorption band is shifted to 595 nm.

## No colour change effect !



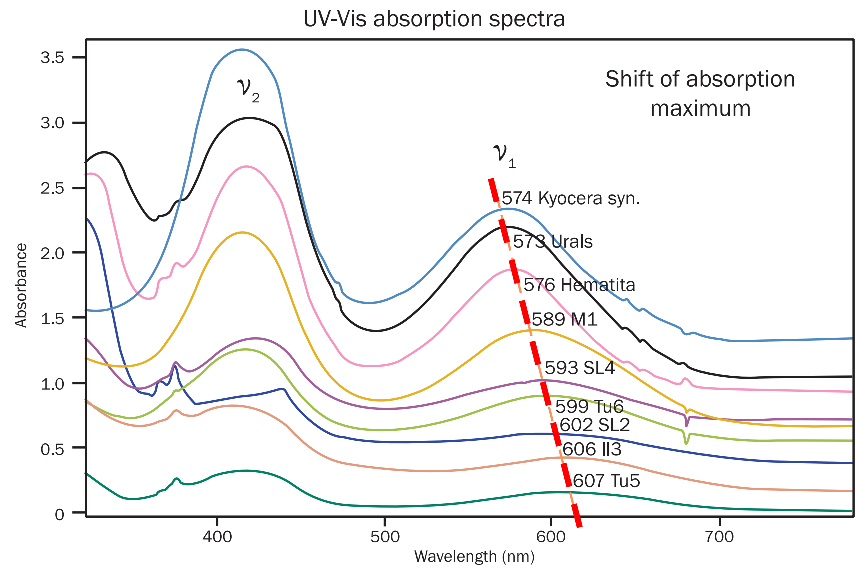
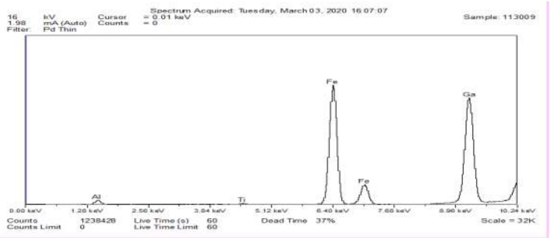




*Figure 14: Non-polarized UV-Vis absorption spectra of V-bearing chrysoberyl from various sources (II*

Schmetzer, Krzemnicki, Hainschwang & Bernhardt, 2013

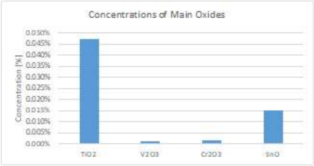
# Not Alexandrite !

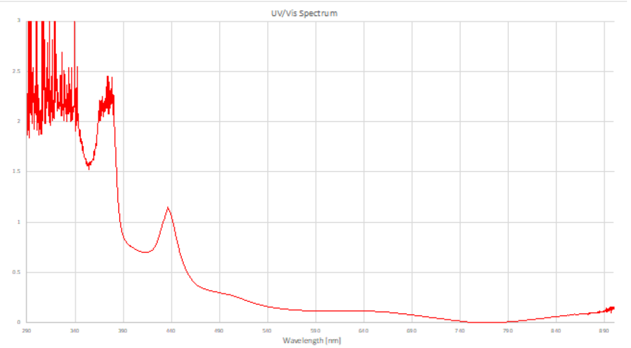
ED-XRF Analysis Report
ID: Chrysoberyl
Weight: 609.920 ct
Date: 04/03/2020
Visum: JB
Instrument: QuantX




113009

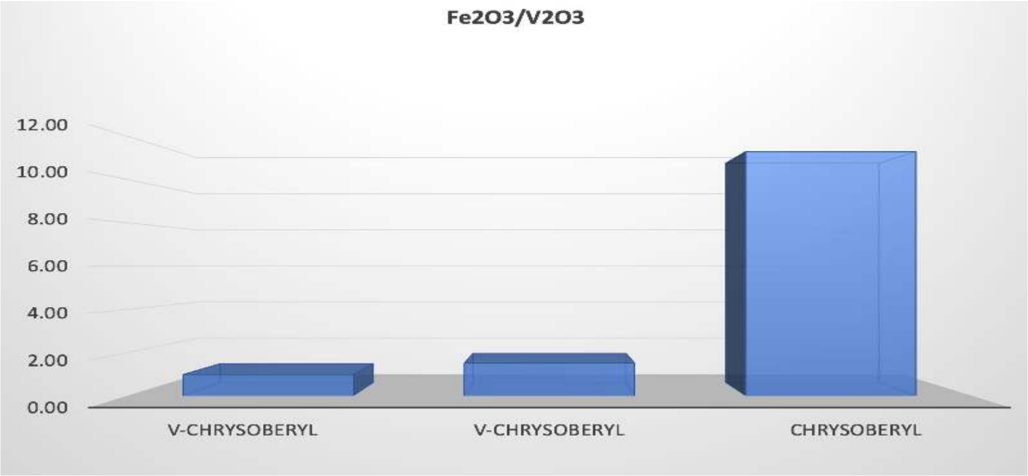
| Symbol | Concentration | Error |
|---|---|---|
| Na2O | 0.000% | 0 |
| MgO | 0.000% | 0 |
| Al2O3 | 79.430% | 0.1 |
| SiO2 | 0.000% | 0 |
| CaO | 0.004% | 0.00052 |
| TiO2 | 0.047% | 0.00078 |
| V2O3 | 0.001% | 0.00042 |
| Cr2O3 | 0.002% | 0.00032 |
| MnO | 0.024% | 0.00075 |
| Fe2O3 | 1.122% | 0.003 |
| NiO | 0.004% | 0.00048 |
| CuO | [0.00015] % | 0.00012 |
| ZnO | 0.002% | 0.00041 |
| Ga2O3 | 0.347% | 0.0018 |
| GeO2 | 0.000% | 0 |
| ZrO2 | 0.000% | 0 |
| SnO | 0.015% | 0.0014 |
| PbO | 0.000% | 0 |
| BeO | 19 % Fixed | |




Impressive chrysoberyl of **609 ct from Sri Lanka.**
Only tiny traces of chromium (0.002 wt%) but much more iron.
Consequently shows no alexandrite effect and by definition cannot be called alexandrite !

# Vanadium-bearing Chrysoberyl


V-bearing chrysoberyl may show attractive bluish green colour but no colour change !

If iron is strongly dominating, then the colour shifts to olive green, thus similar to normal Fe-rich chrysoberyl.

# LMHC meeting, December 2022 at SSEF

PRESS RELEASE

**LMHC makes progress on laboratory report harmonization, discusses current challenges in detection of corundum treatments**

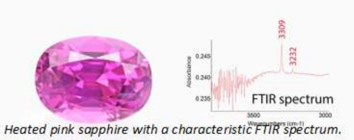
BASEL: MARCH 14, 2023 – Holding its 30th meeting in Basel, Switzerland, the Laboratory Manual Harmonisation Committee (LMHC) has reported notable progress in the harmonisation of language used in laboratory reports. The participants in the meeting also discussed and shared new research findings on the treatments of gemstones, and in particular corundum.

The LMHC meeting, which took place on December 5 and 6, 2022, was hosted by the Swiss Gemmological Institute SSEF.

The LMHC is currently comprised of representatives from the Central Gem Laboratory (CGL), CISGEM Laboratory, DSEF German Gem Lab, Gübelin Gem Lab, GIA Gem Laboratory, The Gem and Jewelry Institute of Thailand (GIT) and the Swiss Gemmological Institute SSEF. The organisation is not formally connected to any trade organisation.

During the meeting, the LMHC members agreed to slight modifications on a number of their information sheets, which are formulated to facilitate better communication and understanding among professionals in the industry.

The main focus of the LMHC meeting was issues raised by treatments of corundum, including rubies and pink sapphires. These include the low-temperature heating and irradiation.




*Heated pink sapphire with a characteristic FTIR spectrum. © LMHC.*

In recent years, an increasing number of rubies and pink sapphires have come onto the market, after having previously undergone so-called "low-temperature heating" (below 1000 °C), meant to slightly shift their colour to a better hue. Furthermore, as was reported in 2022, certain rubies and pink sapphires, some with a slightly purplish tint, have been treated by a limited number of individuals using radiotherapy equipment designed for cancer patients. This treatment can also induce a shift of the colour centre to a more attractive hue.

At the meeting in Basel, the LMHC labs decided to carry further research on these corundum treatments, in order to develop harmonised criteria for detecting their use.

https://www.lmhc-gemmology.org/s/LMHC-Press-Release-30th-meeting-report-14-3-202318.pdf

# 50 Years Swiss Gemmological Institute SSEF

Celebration marked by a symposium with key international speakers providing broad trade expertise and deep insights into mining, cutting, pearling, auctions, jewellery design and other themes.

All talks and a selection of photos of the event:
https://www.ssef.ch/50years

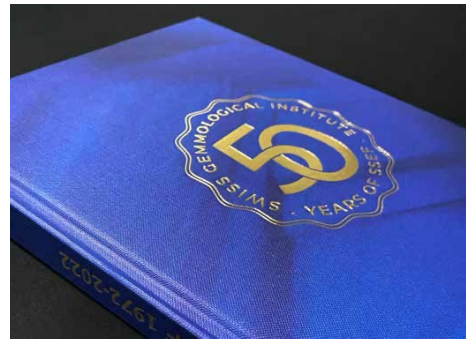
# 50 Years Swiss Gemmological Institute SSEF

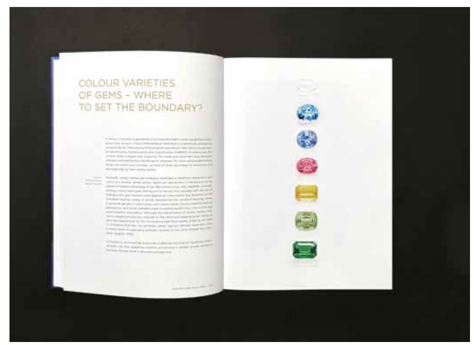


# 50 Years Swiss Gemmological Institute SSEF

Book published to celebrate the 50 year of SSEF.

To obtain a copy, please contact us (admin@ssef.ch).





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