GÜBELIN

GEMMOLOGICAL PROFILE

41.92 CT

BURMESE SAPPHIRE

COMPLEMENTING
GEMMOLOGICAL REPORT

No. Specimen 4

ABOUT THIS DOCUMENT

This Gemmological Profile is complementing a Gemmological Report issued by the Gübelin Gem Lab. The Gemmological Profile has been issued upon request of a client, on the basis of data collected for the described stone at the time of the analysis as stated on the Gübelin Gem Lab Gemmological Report. The Gemmological Profile is only valid if presented together with the original Gübelin Gem Lab Gemmological Report.

Gemmological Profiles provide a more detailed description of a gemstone than the concentrated wording used in Gübelin Gem Lab Gemmological Reports. While Gemmological Reports primarily address the professional traders, Gemmological Profiles attempt to cater the needs of the jeweller and the layperson, who might be interested in getting explanations and background information about gems in general, and their gemstone in specific.

Gemmological Profiles are issued on request, and are available for a broad range of gemstone qualities. Hence, the existence of a Gemmological Profile does not imply any level of quality or rarity of the gemstone it describes. The language used in Gemmological Profiles is more extensive and informal. Statements about certain quality traits of the stone in the Gemmological Profile might be more detailed, and go beyond the sober scientific language deployed in the Gemmological Report. In contrast to the Gemmological Report, whose content is based exclusively on data that Gübelin staff has collected directly from the stone, the Gemmological Profile considers and contains also external, possibly uncorroborated data and information.

We refer to the information stated in the Notes and Limitations section on the backside of the Gemmological Report, and to the General Terms & Conditions. See also www.gubelingemlab.com.

CONTENT

INTRODUCTION

Gemstones are true products of nature, grown millions of years ago in the earth's crust, brought up to the surface by geological processes and eventually found by man who brings out their colour and brilliance by cutting and polishing.

The gemmologist's eye looks beyond the sparkling outer appearance of the stone, attempting to understand how it has formed. Minute crystals, fluid inclusions and subtle growth features trapped in its interior are witnesses of its formation ages ago and in tens or even hundreds of kilometres depths in the earth. This inner life allows us to detect its identity, authenticity and even its geographic origin.

This Gemmological Profile complements the Gübelin Gem Lab Gemmological Report No. SPECIMEN 4, contained in the inside cover page of this booklet. In this Profile, we present our insights and findings for the 41.92 ct Burmese sapphire, disclosing some of its microscopic, chemical and structural characteristics and providing valuable information about its genesis and origin.

We intend to share with you a bit of the story that your gemstone tells us on its very individual history and personality.

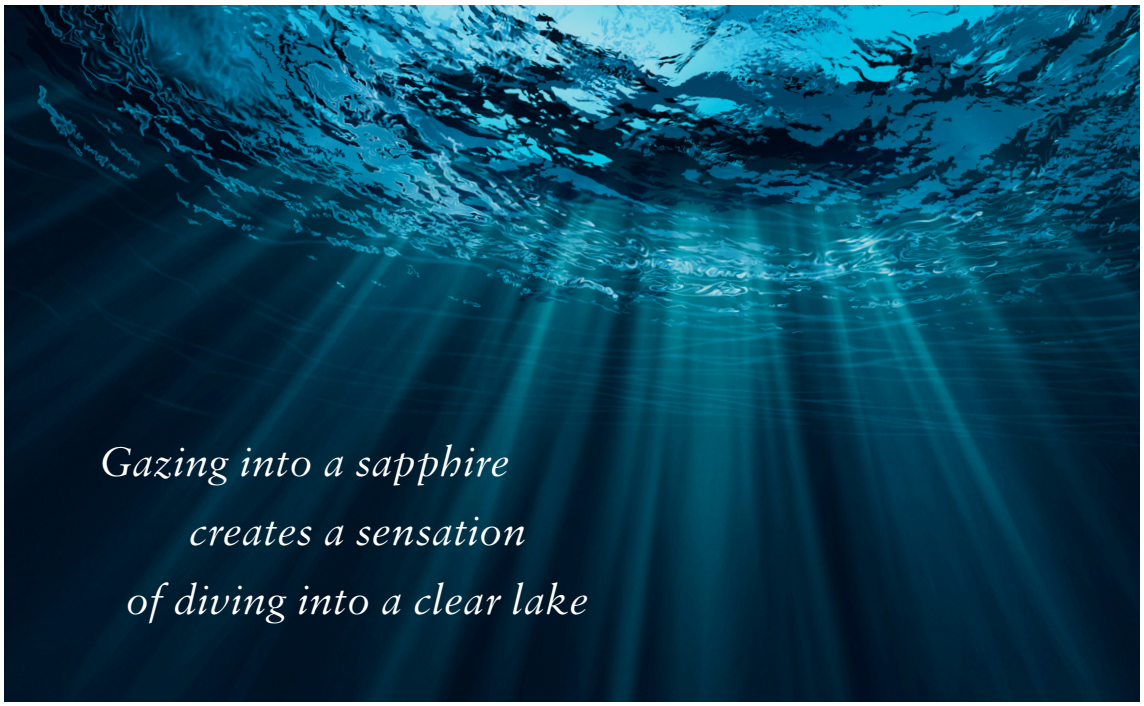
On April 24, 2018, the Gübelin Gem Lab in Lucerne has been entrusted with testing the 41.92 ct gemstone presented here. The careful assessment and detailed analytical studies performed on this gemstone revealed the results provided in the Gemmological Report No. SPECIMEN 4 and are described in more detail in this Gemmological Profile.

HISTORY & SYMBOLISM OF SAPPHIRE

The word ‘sapphire’ is thought to be derived from the Latin ‘sappirus’, itself coming from the ancient Greek ‘σαπφειρος’ or ‘sappheiros’, meaning ‘dark blue stone’. Other sources point towards a Sanskrit origin ‘sauriratna’ (‘beloved of Saturn’) and even associations with the gem-producing island of Saphirine in the Arabian Sea have been made. The ultimate root is most likely Semitic, with the Hebrew word ‘saffir’, meaning ‘most beautiful’, or ‘perfect’ [ACA]. Many mystical connections and magical properties have been ascribed to sapphire. The Greeks associated sapphire with prophetic qualities, while Buddhists regard it as bringing spiritual light. In India and Arabia it was worn as a protective amulet against the Evil Eye, plague and pestilence, to name just a few healing and spiritual qualities. The sapphire has often been given a noble, eminent, even heavenly position. An early celestial association was the Persian belief that the world was founded upon a sapphire whose colour was the cause of the blue of the sky, while the ten commandments given to Moses were supposedly engraved upon tablets of sapphire [ACA].

Sapphire owes its appreciation to its deep, often fathomless blue colour, gazing into it creating a sensation of diving into a clear lake or a rising up into the blue sky. It is this pure, saturated blue hue that instils a sensation of endlessness. The depth and the high transparency of fine sapphires transcend honesty, purity and loyalty. By the Middle Ages, the colours of blue and purple had become representative of royal and religious power, and bishops, princes and kings adopted sapphire as the ideal symbol of their earthly and heavenly power, but also as a sign of purity and to protect them from unclean thoughts.

ACA This abbreviation refers to specific contents of the Coloured Gem Professional classes provided by Gübelin Academy. For detailed information visit gubelinacademy.com



DESCRIPTION

Weight

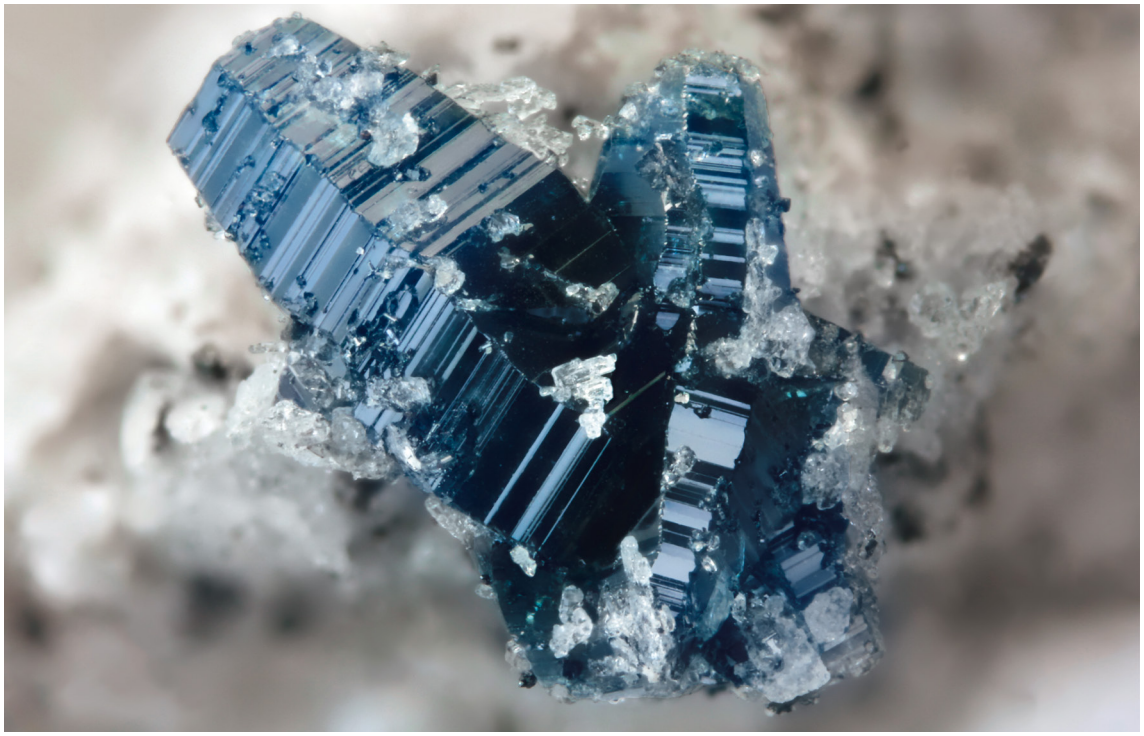
Sapphires are minerals forming deep in the earth, under specific geologic conditions of high pressures and temperatures. A delicate balance of the right chemical elements is required to supply the growing crystal with the ingredients that finally lend it an appealing blue colour. Crystal growth is usually a slow process extending over several tens of thousands years at least and rarely the required balance of availability of the just right chemical constituents is maintained throughout the growth of a sapphire. Skilful cutting is needed to bring out the best part of the rough crystal, further reducing the weight of the gemstone typically to less than 50 percent [ACA] and resulting in a final weight of 41.92 ct for this stone.

Large, unheated specimens of sapphire displaying a saturated, equally distributed blue colour, such as shown in this 41.92 ct sapphire, are considered rare.

Shape & cut

The final shape and cut of the gemstone is the result of a highly complex decision taken by the cutter and mainly defined by the shape and the quality of the rough crystal. The cutter tries to find a balance between maximising the colour, brilliance and transparency, while retaining as much weight of the crystal as possible.

Special attention is given to the appearance of the colour, the key property in all coloured gemstones [ACA]. Sapphires grow in an oriented manner, resulting in differences of colour – sometimes subtle, sometimes distinct – when viewed from different directions. This effect, called pleochroism [ACA], is carefully considered by the cutter and plays a pivotal role in getting the best out of a piece of rough crystal.



These considerations were also applied on the present crystal. It was fashioned into a cushion shape, using a cutting style that combines features of both the brilliant cut and the step cut. The dimensions of the gemstone are 20.93 mm in length, 17.25 mm in width and 13.27 mm in depth.

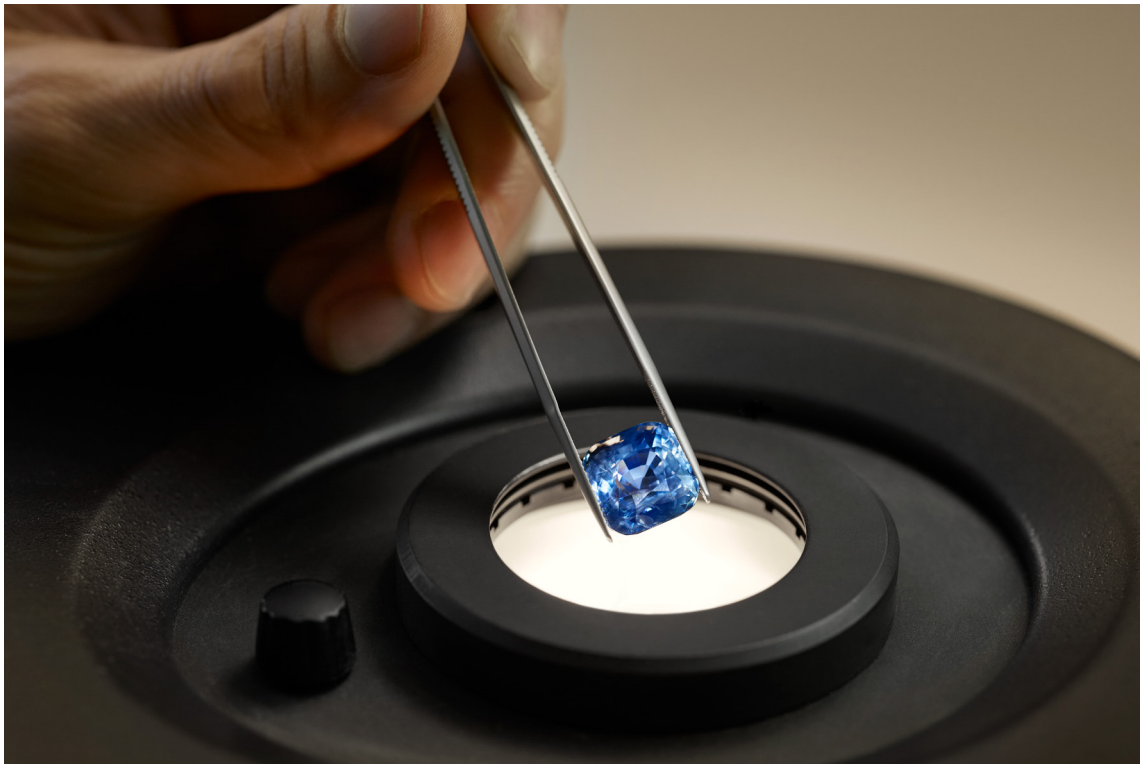
Colour & transparency

The single most important criterion of a gemstone's quality is its colour. Sapphires cover a broad range of different shades and nuances of blue, often with a subtle contribution of a secondary colour such as purple, exhibiting a variety of saturation and tones. While all combinations have their own charm and legitimacy, a pure, saturated blue colour is the most coveted amongst connoisseurs.

The colour of the present gem is exceptional, characterised by an intense, saturated blue colour, free of any secondary colour.

As a rule of thumb, the transparency of gemstones usually follows the same logic as in diamonds: the cleaner – i.e. showing not or few internal features only – the better. Tiny, usually microscopically small inclusions are a common and welcome feature in coloured gemstones. Ideally, however they should not affect the transparency of the stone.

One very peculiar type of microscopic inclusions of Burmese sapphires – also found in the 41.92 ct sapphire – are needles. Usually made up of rutile crystals, needles strictly follow the atomic structure of the corundum crystal. These minute needles slightly scatter the incoming light and contribute to the softness of appearance highly treasured by sapphire connoisseurs [ACA]. Hence, the presence of a certain extent of needles is considered an enhancement of a sapphire's beauty.



Identity & authenticity

One most fundamental information any gem lab report has to provide is the identity of the stone. Sapphire is defined as crystalline aluminium oxide Al_2O_3, called corundum, with traces of the chemical elements iron and titanium. In gems, such trace elements are most commonly the agents responsible for adding colour. Despite their small contribution to the overall chemical composition of the gemstone, trace elements play a key role in determining whether a mineral is just a standard stone or a rare and coveted gemstone. Merely by replacing a few aluminium ions in the atomic structure of corundum with iron and titanium, common, colourless corundum gets turned into a sapphire of an attractive blue colour [ACA].

Different types of minerals and other materials might be used to fake sapphire, i.e. act as so-called simulants. Clearly, the value of a simulant is a fraction only of the true sapphire.

As sapphire can also be grown synthetically, the authenticity needs be addressed; is the sapphire indeed of natural provenance, i.e. grown millions of years ago in the depth of the earth, or if it is a synthetic sapphire, i.e. a man-made crystal? Synthetic sapphires are known for more than a hundred years and possess chemical and physical properties almost identical to natural sapphires. But the production and hence the supply of synthetic sapphires is virtually unlimited, which reduces their value dramatically compared to a pristine, naturally grown sapphire.

The 41.92 ct gemstone has proven to be of the blue variety of natural corundum, called sapphire.

Overall quality assessment
The 41.92 ct sapphire described in Gübelin Gemmological Report No. SPECIMEN 4 is of exceptional visual quality.

Royal Blue
This stone further qualifies for the term royal blue, a term coined by the trade many centuries ago to describe a deeply saturated, intensively blue colour in high-quality sapphires. Historically, the term royal blue was used for the best types of sapphires originating from Burma, but is meanwhile also known to be found in other sources. Dr. Eduard Gübelin described this colour as deep, luscious, and unfathomable. The Gübelin Gem Lab reserves this term for the small number of sapphires that fulfil a very comprehensive set of quality features, including the correct hue, tone and saturation, the complete absence of any treatment and a very good transparency.

Many famous stones, such as the Rockefeller Sapphire are of this intriguing shade of blue, adding to the fame of royal blue sapphires [ACA].

The Mogok Valley, Burma

ORIGIN

Throughout history, gemstones – in particular rubies, sapphires and emeralds – have been associated with specific countries and mining localities by virtue of their outstanding beauty and quality. However, the outward splendour of a gemstone is not all that contributes to the prominence of a particular source.

The history and notoriety – often tumultuous – with which many exceptional gemstones are associated, combined with a relatively steady production over decades or even centuries, have contributed greatly to the reputation of a few specific gem deposits.

The country of origin of the present 41.92 ct sapphire has been determined to be Burma, known since centuries as the provenance of sapphires of unique beauty. Even more so, Burma is the unchallenged leader of producing ruby, the red variety of corundum. In addition to the beauty of the two varieties of corundum from this country, the appellation 'Burma' evokes an aura of adventure and romanticism, with associations steeped in a rich cultural history, lush countryside, grand architecture and fascinating foreign cultures.

Burma – now known as Myanmar – has achieved near-mythical status amongst lovers of rubies and sapphires.

Thanks to a complex geology of both contact and regional metamorphism, together with a combination of different geologic processes, the area around Mogok, a day-ride North-East of Mandalay, is almost unrivalled in the diversity of its natural assets. It is a rich reserve for a whole host of other species than ruby and sapphire: spi-

nel, topaz, peridot, tourmaline, chrysoberyl, moonstone, to name a few.

Determination of Origin
The geographic origin of this sapphire has been determined in comparison with sapphires from the gemstone reference collection of the Gübelin Gem Lab.

With more than 27,000 stones, it is probably the world's most complete collection of gemstones gathered from all the commercially relevant mines worldwide. The collection has been started in the 1930s and is maintained up to this day. It hence also encompasses mines which are exhausted or closed decades ago. This unique reference collection, combined with the most sophisticated analytical techniques, allows the scientists of the Gübelin Gem Lab to determine the origin of most sapphires, solely based on the observations and data they collect on the stone.

Leading gemmological laboratories, such as the Gübelin Gem Lab determine the origin, i.e. the geographic provenance of a gem by comparing its microscopic, chemical and spectroscopic properties with the properties of gems from secured origins.

If the pattern of properties gathered from the unknown stone matches the one from the reference stones, an origin can be determined. However, this is sometimes not a straightforward process, as the properties of sapphires from different deposits might overlap. Although today they might lie thousands of kilometres apart, their geologic setting might be similar, or the host rocks were even adjacent to each other millions of years ago when the gem grew. Hence, despite skilful assessment and evaluation of carefully collected analytical data, the determination of the origin is not feasible for any stone.

The trustworthiness of the final opinion is – among other factors – defined and limited by the completeness and quality of the lab's knowledge database and reference collection. This is why the Gübelin Gem Lab continuously invests a significant share of its revenues in research and development, both in-house as well as in joint projects with universities and other external scientific research institutions[1].

[1] The annual 'Dr. Eduard Gübelin Research Scholarship' is another key engagement of Gübelin to contribute to the advancement of gemmological knowledge. For more information visit www.gubelingemlab.com/scholarship.

GEOLOGY & AGE

The sapphires in Burma are the consequence of a major geologic event, when the Indian subcontinent drifted towards the Eurasian plate and eventually collided into it, a process that started some 64 million years ago and is ongoing to this day. This collision resulted in a thickening of the earth's crust – forming the Himalayan mountain range – and triggered the formation of rubies and sapphires along that plate boundary, stretching from Tajikistan, Afghanistan, Pakistan, and Nepal, to Burma, Vietnam and Thailand [ACA]. By applying radiometric dating techniques, we know that Burmese sapphires, such as the 41.92 ct sapphire presented here, formed some 27 million years ago at a depth of around 10 kilometres below the earth`s surface, at temperatures between 550 and 700 degrees Celsius.

Major sapphire deposits

TREATMENT

Traditional blow-pipe heat treatment

Heating has been applied for centuries, and even millennia, to improve both the colour and clarity in corundum. References in Pliny show a diverse knowledge of various mineral treatments in the Roman period and explicit literary references to the heat treatment of sapphire are found in early mediaeval Arabian and Renaissance European texts [ACA].

Generally, heat treatment offers a way of turning sapphires of less desired quality into highly attractive gems. Treatment is thus an important way of overcoming the enduring undersupply of aesthetically appealing gemstones. However, each treatment must be properly and accurately disclosed, as the presence and the type of treatment influences the value of a sapphire significantly.

The resulting small number of natural gem sapphires of good colour and transparency, compared with their heated and otherwise treated counterparts, underlines their rarity. The sapphire presented here is one such rare example of unheated sapphire.

WITHIN SAPPHIRE

Careful study of the internal features and properties gives valuable insights into the identity, authenticity and sometimes the origin of a gemstone. All these characteristics are the result of the individual history of this specific gemstone, providing a patchy and fragmented – but very personal – diary from its growth in the inner parts of the earth, its uplift to the surface, to the mining process and finally the processing by man. The first chapter of this diary, on the growth of the crystal, reveals insights to the geological setting in which the mineral formed, the pressure and temperature conditions and the specific chemical environment prevailing at that time. To unravel these secrets from this 41.92 ct sapphire, the scientists at the Gübelin Gem Lab have scrutinised its microscopic features, analysed its detailed chemical composition and its physical-structural properties.

Microscopic features

In combination with the magnifying aid of a microscope, the experienced human eye provides an extremely sensitive, powerful and versatile analytical tool. The determination and description of the microscopic characteristics found in a gem – ranging from tiny crystals, fluid inclusions and particles, to growth features and minute fissures – provide a comprehensive qualitative survey indispensable for any gemmological conclusion.

Some of the internal features recorded in this sapphire include long and short rutile needles, and bell-type healing fissures. These inclusions are regularly observed in Burmese sapphires, and are potentially helpful indicators to determine its authenticity and origin[2].

Further to these characteristic inclusions ilmenite platelets and fine particles are other internal features present in this 41.92 ct sapphire.

2 For more information about the inclusions in gemstones contact the Gübelin Academy or consult 'Photoatlas of Inclusions in Gemstones' (see chapter 'Addendum')

Iridescent rutile needles and elongated platelets as seen in this 41.92 ct Burmese sapphire. The rutile inclusions are oriented in three directions.

Chemical features

In addition to microscopic features, a number of technologically advanced analytical methods are deployed to contribute to a secure determination of a gemstone's authenticity and origin. These more sophisticated methods can be grouped into spectroscopic and chemical methods. Both types give hints to the type of rock in which the gem formed and might also reflect alterations imposed by a possible treatment process.

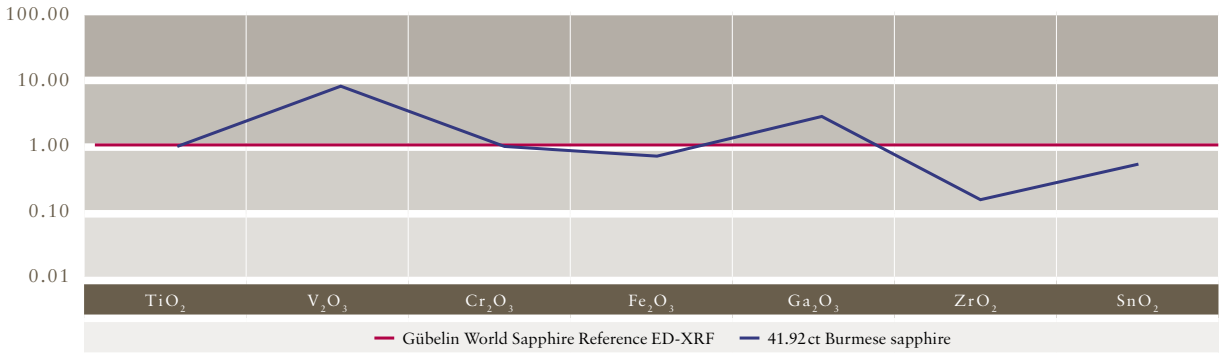
Sophisticated analytical techniques[3] measure the concentration of chemical elements in gems. Aside from the main and minor elements, gemstones also contain other elements present in even smaller concentrations of a few parts per million.

These trace elements typically do not have any significant influence on the appearance of the gemstone, but they shed light on the environment in which it grew thousands, millions or even billions of years ago. The type and amount of these elements in a gemstone are often indicative of a specific location and are used by gem labs to determine its country of origin.

The trace element concentrations of this 41.92 ct sapphire vary slightly to the Gübelin World Sapphire Reference[4], as shown in the trace element diagram. The chemical fingerprint measured in the present gemstone displays the characteristic deviations we expect for a sapphire from Burma. This chemical fingerprint is individual and unique for this 41.92 ct sapphire, exactly like the genetic DNA is individual and unique for a specific creature.

[3] For more information about the applied analytical methods visit www.gubelingemlab.com

[4] The Gübelin World Reference Sapphire is an empirical trace elemental composition of an assumed sapphire with the averaged and weighted concentration of potentially indicative elements, comprising all commercially relevant deposits worldwide.



Trace element pattern for the 41.92 ct Burmese sapphire, gathered by energy dispersive X-ray fluorescence (ED-XRF) spectrometry. The blue line shows the deviations of a selection of trace element concentrations in comparison to the normalised Gübelin World Sapphire Reference, shown in red.

Pattern of intersecting and reflecting rutile needles, typical for sapphires from Burma

Cutting-edge chemical analysis: 193 nm Laser-Ablation ICPMS unit, operated at the Gübelin Gem Lab in Lucerne

Spectroscopic features

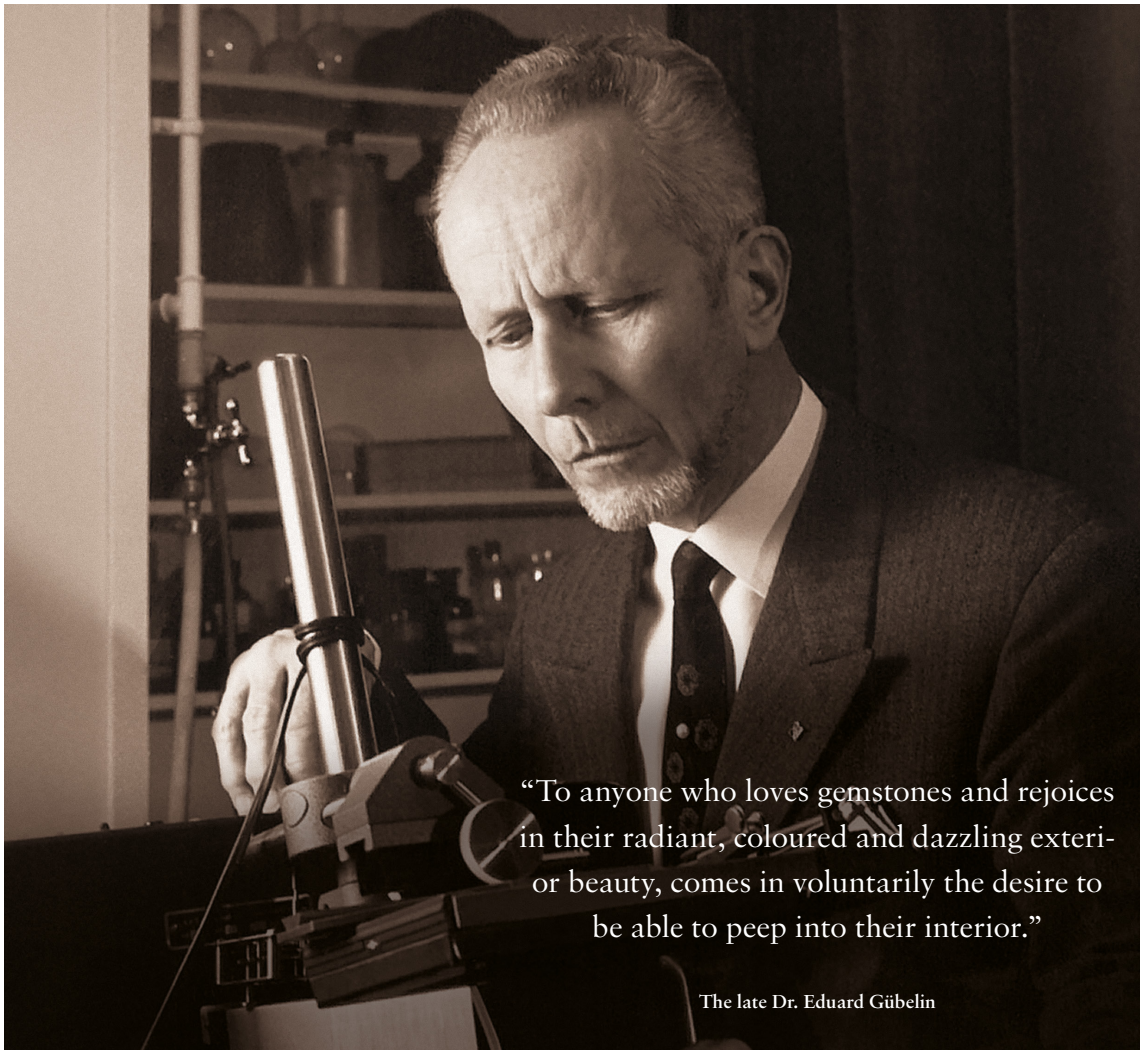
Different methods of spectrometry are applied to help determining possible treatments and the origin of a gemstone. These analytical techniques apply electromagnetic radiation that interacts with the gemstone, providing information about its chemical and structural constituents (i.e. elements, molecules, crystallographic properties) through the characteristic absorbance of visible, infrared and/or ultraviolet light.

Spectroscopy applying ultraviolet to visible light can provide clues on the geological environment in which sapphire formed in the earth's crust.

The present 41.92 ct sapphire shows spectroscopic features typical for sapphires formed in rocks that crystallised during a major geologic event referred to as regional metamorphism.

ABOUT GÜBELIN GEM LAB

The roots of the Gübelin Gem Lab go back to the 1920s. The laboratory's standard of excellence and tireless devotion to the science of gemmology, pioneered by the late Dr. Eduard Gübelin, soon came to be rewarded with international esteem and recognition. Today, the team of the Gübelin Gem Lab is composed of highly trained and experienced professionals who share a passion for the treasures released by the earth and entrusted to our hands by our clients. We combine state-of-the-art analytical techniques, expertise and extensive practical skills when it comes to interpreting gemmological and geological data and rendering a professional opinion on diamonds, coloured stones and pearls. We are committed to maintain the integrity and reliable service that our clients have come to expect from the Gübelin Gem Lab.



ADDENDUM

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Gübelin Gem Lab Ltd.
Lucerne
Maihofstrasse 102
6006 Lucerne, Switzerland
T: +41 41 429 17 17
F: +41 41 429 17 34
info@gubelingemlab.com

Gubelin Gem Lab Ltd.
Hong Kong
Room 1005, 10/F,
China Building
29 Queen's Road Central,
Central, Hong Kong
T: +852 2868 2781
F: +852 2868 2791
hkg@gubelingemlab.com

Gubelin Gem Lab Ltd.
New York
608 Fifth Avenue, Suite 806
New York, NY 10020, USA
T: +1 212 956 0428
F: +1 212 956 0429
ny@gubelingemlab.com
www.gubelingemlab.com

Gübelin Academy

Gübelin Academy was established in 2013 to offer unique, fast-track training into the wonderful world of coloured gems. Designed for professionals as well as enthusiasts and connoisseurs, courses cover the basics as well as the advanced history, gemmology and psychology behind the most precious and colourful commodities in the world.

Gübelin Academy
Room 3405-3406, 34/F
Gloucester Tower,
The Landmark
15 Queen's Road, Central,
Hong Kong
T: +852 2264 6898
F: +852 2440 4040
info@gubelinacademy.com
www.gubelinacademy.com