



## GEMMOLOGICAL REPORT

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**Report Number**  
21020011

**Colour**  
green

**Date**  
9 February 2021

**Species**  
Natural beryl

**Item**  
One faceted gemstone

**Variety**  
Emerald

**Weight**  
4.57 ct

**Origin**  
Zambia (Kafubu)

**Shape**  
octagonal

**Condition**  
Indications of minor clarity enhancement with a traditional filling material (oil-type).  
Natural emeralds are commonly clarity enhanced.

**Cut**  
step cut

**Measurements**  
11.39 x 8.92 x 5.84 mm

**Comments**  
See Information Sheet(s).

**Transparency**  
transparent

Important notes and limitations on the reverse.



Dr. Wenxing Xu



Dr. Klaus Schollenbruch





GÜBELIN

## GEMSTONE RATING

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GÜBELIN POINTS

87.1

Fine

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Emerald



Weight:  
4.57 ct

Scan QR-Code for more information



Gübelin Gem Lab  
Lucerne Hong Kong New York  
[www.gubelingemlab.com](http://www.gubelingemlab.com)

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## INFORMATION SHEET

to Report No. 21020011

### Emeralds from Zambia (Kafubu)

The landlocked Republic of Zambia is located in the south-east of the African continent, a region known for its wealth of gemstones.

Emerald, a green variety of the beryl group, has been explored in Zambia as early as the late 1920s. It was only in the mid-1970s, that the promising Kafubu emerald fields were discovered in north central Zambia (the Ndola-Rural-Restricted-Area), 45km south-west of the town of Kitwe. At an altitude of 1,200 m above sea level, the entire area is mostly flat and the nearby Kafubu River - after which the mines were named - drains the area characterised by clay-rich soils with extensive crusts of laterite and dense vegetation.

For emeralds to form, specific geological conditions are necessary. In the Kafubu mines, the chromium-bearing talc-chlorite-actinolite schists were intruded by pegmatites and hydrothermal veins. This event occurred about 450 million years ago, during late stages of the Pan-African orogeny. Temperature and pressure conditions, as well as the availability of the necessary chemical elements, allowed emerald growth in phlogopite reaction zones between quartz-tourmaline veins and metabasite.

The most prominent colours of Zambian emeralds range from light to dark green and slightly bluish to bluish-green. They show a distinct pattern of trace elements, including chromium and iron as the main colourants, as well as appreciable concentrations of alkali elements.

Emeralds naturally tend to have numerous inclusions providing a valuable insight into their growth history as well as imparting individuality. Typical inclusions seen in Zambian emeralds are so-called fingerprints, consisting mostly of two-, occasionally also three- or multi-phase fluid inclusions, often displaying a square or elongated shape. The range of crystal inclusions comprises iron oxides and sulfides, amphibole, tourmaline, and other silicate minerals.

Since the liberalisation of mining in the early 1990s, Zambia has risen to become one of the most valuable emerald sources in the world. The Kafubu mining area is worked by artisanal and small-scale mining operations archetypical of the coloured gemstone industry, as well as one of the world's largest open-pit mines for coloured gemstones.

Information Sheets are intended to provide information supplementary to the contents of the Report and comment on, for instance, the type of gemstone, the geographic origin and the presence or absence of treatments. By definition, Information Sheets are purely informative in nature; they consist of a standard text and are issued for all types of stones of that particular category. Information Sheets, therefore, do not imply a certain quality or rarity of the stone described in the Gübelin Gem Lab Report which it is attached to.

## INFORMATION SHEET

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### Emerald, determination of the type of filler material

The practice of enhancing the visual appearance of emeralds by filling surface reaching fissures with oil or resin is a standard procedure. Such fissure filling can improve the visual appearance of an emerald dramatically. This treatment is generally accepted as a necessity due to the fractured nature of emeralds.

Gem labs are determining the presence or absence of any clarity enhancing substance in emeralds, and grade its extent. A broad variety of substances are applied for this treatment, characterised by different optical and mechanical properties, stability and durability. Following the growing request from end consumers for full disclosure, the Gübelin Gem Lab has decided to also offer the determination of the type of filler material, distinguishing different types.

Oil is a traditional type of filler in emeralds, used since more than two thousand years. Mostly of low viscosity it penetrates deep into the surface-reaching fissures. Oil can leak or dry out over time, losing its clarity enhancing effect. With the help of cleaning agents such as acetone, the oil can be removed. Hence, oiling is a reversible and repeatable process.

In the definition of the Gübelin Gem Lab, the oil-type group comprises different types of vegetable oils, paraffin oils (such as Johnson's baby oil), or natural and synthetic Canada balsam and cedar wood oil (tree oils). Most oil-type fillers are liquid to viscous at room temperature.

Resins are a more modern type of filling material, used since the middle of the last century. Mostly of synthetic origin, resins comprise several solid or highly viscous substances characterized by optical properties close to those of emerald, and, once applied in fissures, a high viscosity. This property makes resin more durable and stable, and hence suitable not only for clarity enhancement, but also for stabilising lower quality material which would not normally be sufficiently durable for use in jewellery without such treatment. Consequently, lower grades of emerald are mostly treated with resin. Due to their more stable nature, resins are harder to remove from fissures. Some resins are applied in combination with a polymerising hardening substance. The most common resin types and brands include: Opticon, Palm Resin (aka Palma), PermaSafe, ExCel, Emerald Beauty, Gematrat.



Wax, typically paraffin wax, is another category of filling material used in emeralds. Wax is defined as solid at room temperature, malleable and not soluble in water. On its gemmological reports, the Gübelin Gem Lab uses the following wording for the different types of filling materials:

- a. Traditional (oil-type)
- b. Modern (resin-type)
- c. Mixed (oil-type and resin-type)
- d. Wax

The type of filling material is mainly determined by spectroscopic methods, namely FTIR and Raman. The hardener contained in some type of resins shows spectroscopic properties of oil. Hence, such resins often cannot be distinguished from an oil-resin mix.