PROVENANCE
PROOF

EMERALD PATERNITY TEST

The Emerald Paternity Test is a ground-breaking traceability technology enabling a truly independent proof of provenance, back to the exact mine. This novel method provides a new level of transparency, giving miners, governments, jewellers and final customers a tool to test the very source of emeralds, instilling confidence and creating trust.

This booklet gives the relevant information about the Emerald Paternity Test technology, and how it gets applied and tracked along the value chain.

UNKNOWN PATHS

Finally, we have ways to fulfill consumer's expectations regarding transparency of their gemstone's provenance.

Today's buyers have greater expectations when it comes to information about a gem's history. From the sourcing of raw materials, to the principles and values of the mines and companies behind the product, the value chain as a whole has come under scrutiny.

And yet, the conditions under which coloured gemstones are sourced are still highly opaque and lack independent verification.

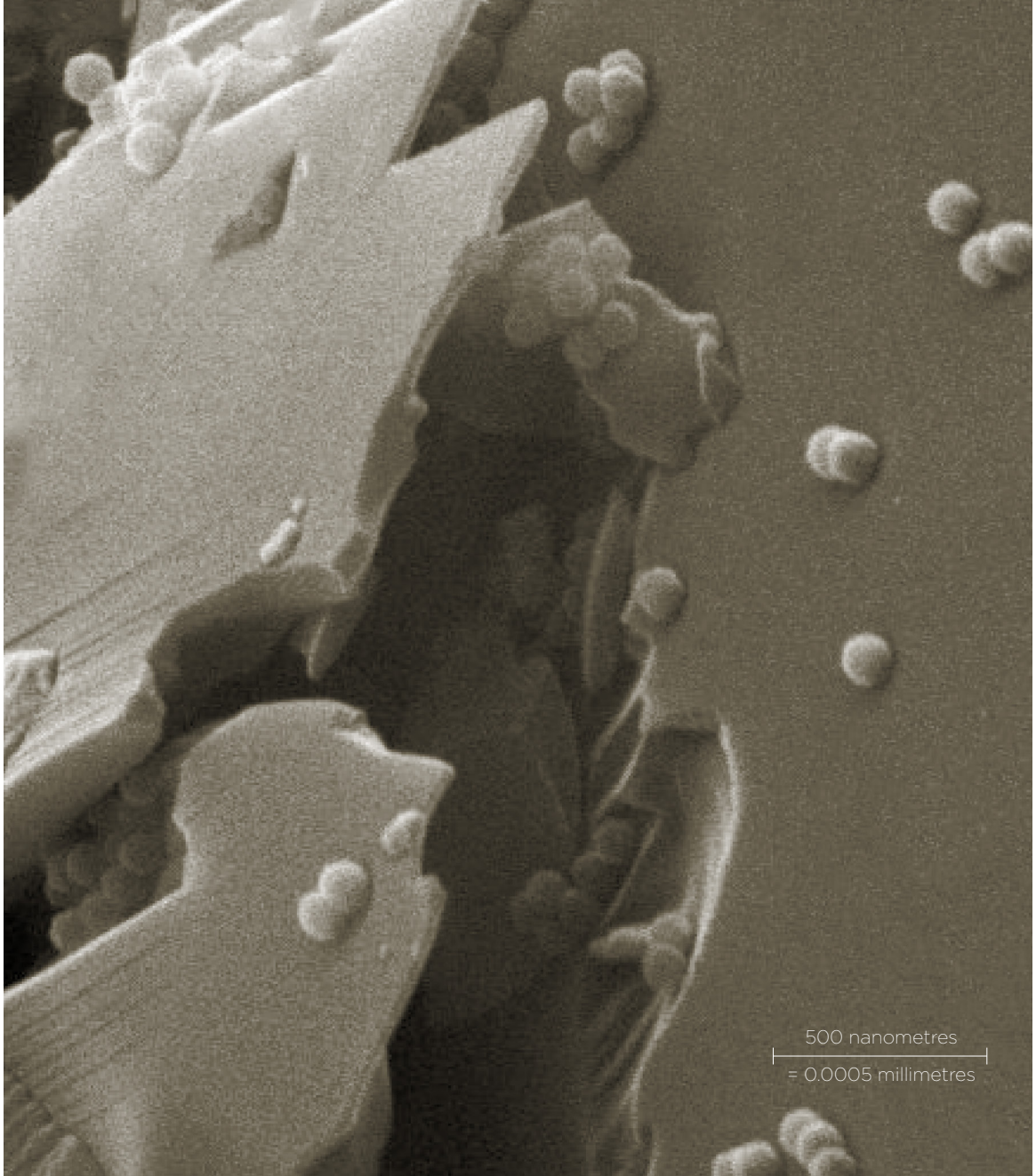
With this in mind, we have established the Provenance Proof™ initiative. It encompasses the development of an array of technologies with the aim of bringing more transparency to every step in the gemstone industry's value chain.

Emerald Paternity Test is a technology under the Provenance Proof initiative, offering an independent proof of the exact source of an emerald.

INVISIBLE TRACERS

Deploying the advances of nanotechnology, we developed a method specifically for gemstones, enabling us to trace back emeralds to the exact place of mining – a true paternity test for emeralds.

Modern nanotechnology allows the invisible labelling of various materials. Nanolabels are used in many industries – e.g. food, cosmetics and petroleum for tracking and tracing purposes, for proving authenticity and against counterfeiting. Thanks to their extremely small size, nanolabels remain invisible and become part of the product they track. The Emerald Paternity Test uses nanolabels based on synthetic DNA, which we customised to suit the specific needs of the gemstone industry.



Spherical DNA-based nanolabels tightly adhering to the surface of a rough emerald crystal, made visible by means of Scanning Electron Microscopy (SEM).

THE EMERALD PATERNITY TEST TECHNOLOGY

An invisible tracer accompanies the gemstone from its birthplace at the mine, all along the value chain to the ultimate buyer of the jewellery item.

Information on the mining location (e.g. country, mining area, mine name), the identity of the miner (e.g. company name, mining cooperative) and the mining period (year, quarter) is encrypted and stored in synthetic DNA. To protect its precious information the DNA is encapsulated in a sphere of silica. Like this, the nanolabels are resistant against modest temperatures, light and humidity.

The nanolabels are applied directly at or near the mine on the rough crystals. During the tagging procedure, they penetrate (sub-) microscopically small fissures that are characteristic for all natural emeralds, and adhere tightly therein.

We have demonstrated that the DNA survives the procedures of cleaning, cutting, polishing and treatment[1]. The nanolabels can be retrieved, the information contained in the DNA read out and decoded later on, disclosing the paternity of the emerald.

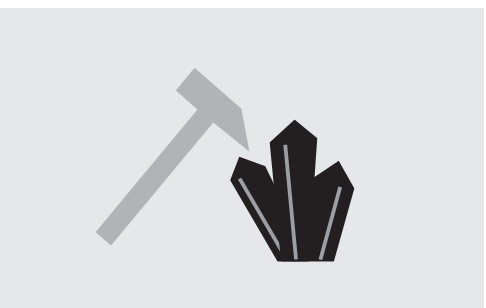
Our nanolabels have a diameter of about 100 nanometres or 0.0001 millimetres. For comparison, a human hair has the diameter of more than 500 of these labels. With such an incredibly small size, these tiny spheres are invisible even to the best optical microscope and in our experience have no optical effect. They can only be visualised by means of Scanning Electron Microscopy (SEM).

We have protected the customisation of these labels and the entire process described here with an international patent, to ensure that the technology is made available and accessible to the entire industry.

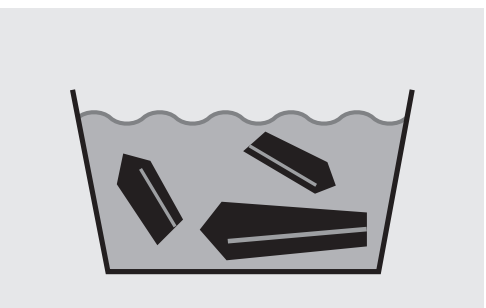
[1] With limitations

STEP BY STEP

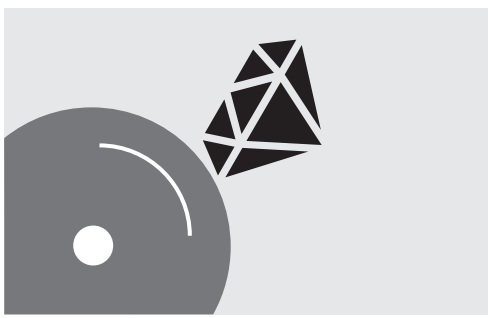
The Emerald Paternity Test kicks in at the very start of an emerald's journey from the mine to the final customer. The nanolabels go deep into the crystal, become part of the stone, and remain in it, conserving the identity of the mine along the entire value chain.



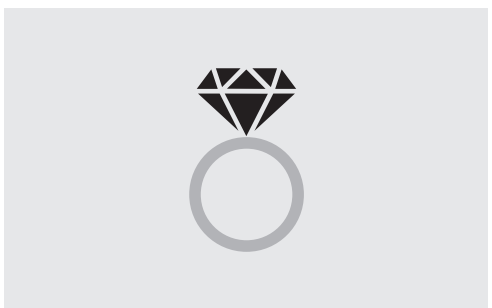
The process starts in the mine, where the emerald gets unearthed. DNA-based nanolabels are synthesised containing the encoded information about the exact mine location, the miner's identity and the mining period.



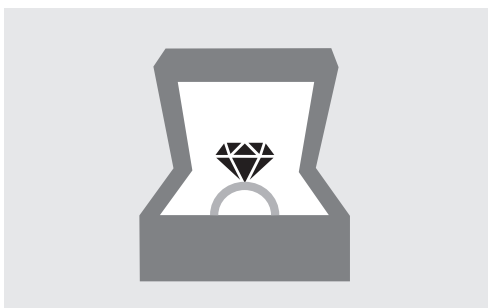
These nanolabels are inserted into the rough gemstones directly at or near the mine. This tagging process is handled by an independent auditor, following a strict protocol.



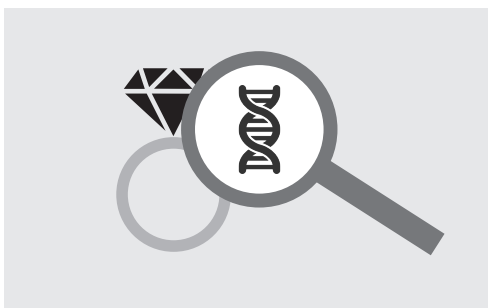
Cutting and polishing can be done as usual. The DNA-based nanolabels are built to withstand the processes that emeralds are typically subjected to.



The mounting of emeralds in a piece of jewellery does not affect the nanolabels. And the nanolabels do not affect the appearance and properties of the emerald.



At the retailer, the Provenance Proof mark inspires trust and brings to the customer additional confidence in the jewel.



Whenever required, and at any stage along the value chain, the stone can be submitted to an authorised lab to conduct the Emerald Paternity Test. This test comprises the retrieval of nanolabels, their analysis and decoding.

AN INTEGRATED AND COMPREHENSIVE SYSTEM

The Emerald Paternity Test is more than a technology. It comprises procedures, guidelines, partnerships, documentation and complementary systems, all dedicated to enable a reliable proof of provenance. Here are the main pillars of the system:

Tagging Event
The application of the tracer technology on the rough gemstones is done during a tagging event. This process is following a strict protocol, to ensure that the nanolabels are applied correctly on the right material only.

Controlled Application
The application of the tracer technology in the mine is handled by an independent auditor. This external company acts as a neutral custodian for the technology. The name of the auditor of a specific tagging event is stated on the Provenance Proof website.

Tracking Confirmation
We provide the miner with a Tracking Confirmation card for the stones that have received the tracer technology. The QR code on this card links to a website showing the Authorised User, and stating the provenance of the stone for which the Tracking Confirmation was issued. Additionally, this website explains the technology and purpose of the Emerald Paternity Test.

Code of Conduct
The right of using the tracer technology is subject to a binding agreement that defines the standards and conditions that apply. The Code of Conduct, as well as specimens of other documents, can be found on the website www.provenanceproof.com.

Authorised Users
The entity – typically a miner – using the tracer technology on its emeralds is disclosed in the List of Authorised Users on the Provenance Proof website. It shows the names of the mining companies and cooperatives that are entitled to use the Emerald Paternity Test on their gemstones for a specific mine and mining period. Authorised Users and their clients are allowed to use the Provenance Proof logo on their marketing material.

Certificate of Provenance
Anyone who wishes to execute the Emerald Paternity Test can do so by sending the stone to one of the laboratories authorised to run the specific testing procedure. Upon the successful retrieval and analysis of the nanolabels, the decoded identity of the miner, mining location and mining period is stated on the Certificate of Provenance.

Tracking Confirmation card, accompanying emeralds that contain the tracer technology

MORE TRANSPARENCY FOR THE ENTIRE INDUSTRY

The Emerald Paternity Test is a true game-changer for the coloured gemstone industry. It enables all stakeholders to work towards the realisation of their goals of transparency.

Mining companies
Mining companies and cooperatives, small and big, are key to achieve a new level of transparency. They unearth the rough crystals and start the journey of the gemstone. And it is the mining company that kicks-off the Emerald Paternity Test, enabling the traceability of the gemstone.

Industry organisations
Industry and trade associations, civil society organisations, NGOs and other outfits overseeing the gemstone industry and the extractive sector in general can – directly or indirectly – use this technology to facilitate and check the implementation of policies and standards in the industry.

Governments
National and local governmental bodies can use the technology to promote and monitor their domestic production, control exports and support the marketing and branding of their country's gemstones.

Jewellery brands
Jewellery houses and jewellery manufacturers can make sure that the gemstones they use in their jewellery are in line with their brand and values.

Retailers
Jewellery retailers, real and online, have a new way to tell a proven and more complete story of the gemstone they sell. The client can verify the provenance claim of the retailer. This connects the consumer more deeply and intimately to the product, fostering trust and loyalty.

Individual
The end consumer gets an insight into the conditions pursued at the birthplace of the gemstone used in the final jewellery piece. This transparency finally gives the peace of mind, which responsible consumers expect today when buying luxury goods.

ENABLING TRANSPARENCY

The Provenance Proof initiative is the umbrella brand of a bundle of technologies with the combined aim to bring transparency into the gemstone industry.

While the Emerald Paternity Test described here uses physical tracers, another major project of the Provenance Proof initiative pursues the complementary approach of a digital track of a gemstone along the value chain; the Provenance Proof Blockchain creates a digital, decentralised logbook based on blockchain technology that records individual peer-to-peer transactions, creating a virtual ledger secured through cryptography. These two different methods almost perfectly complement each other, and can be used in combination or separately.

The Provenance Proof initiative has been established by the Gübelin Gem Lab, an independent division of the House of Gübelin, founded in 1854. All solutions and services developed and offered under the Provenance Proof brand are available to the entire industry. Provenance Proof is an entity separate of the Gübelin Gem Lab, to grant the required independence.