LIGHTIGO

LIGHT UP YOUR ANALYSIS

RAPID MULTI-ELEMENTAL ANALYSIS

Based on **Laser-Induced Breakdown Spectroscopy**

Toxis elements detection

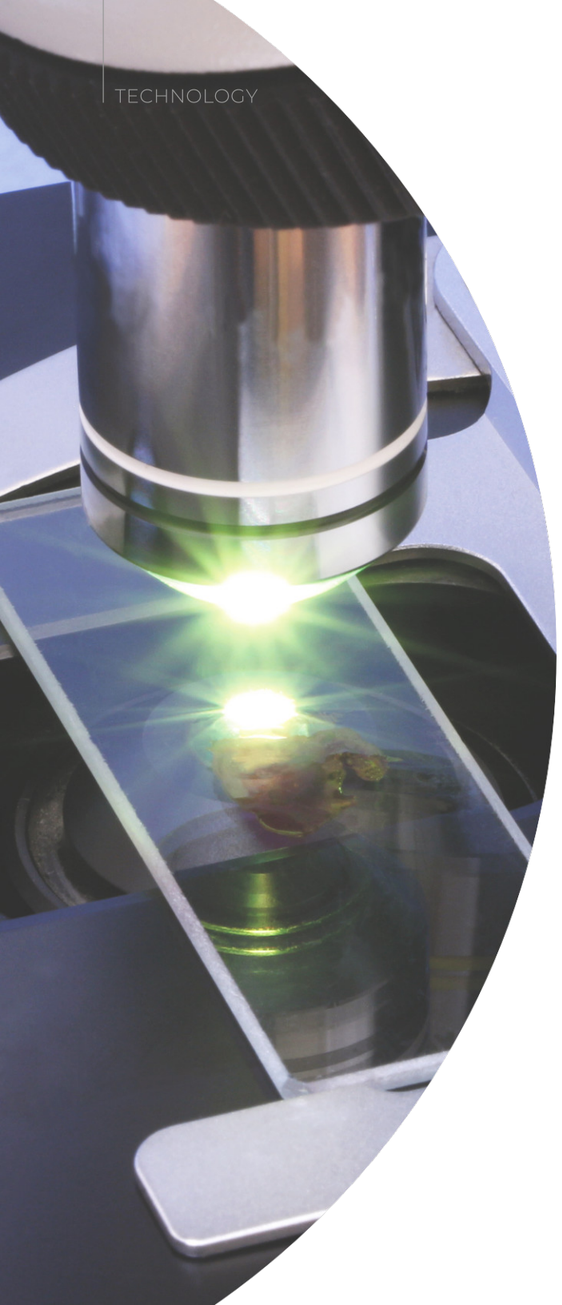
Quality check

Sorting

Depth profiling

Remote analysis

Chemical imaging



LASER-INDUCED BREAKDOWN SPECTROSCOPY (LIBS)

One of the most promising techniques of elemental analysis.

Efficient combination of Laser ablation and Atomic Emission Spectroscopy.

The physical principle of LIBS and the purely optical approach give LIBS a number of significant benefits.

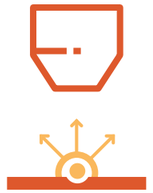
LIBS in 3 steps

1

Laser ablation

The pulsed laser is focused on the sample. The irradiance value of more than hundreds of GW per square cm evaporates and ionizes any type of sample.

2



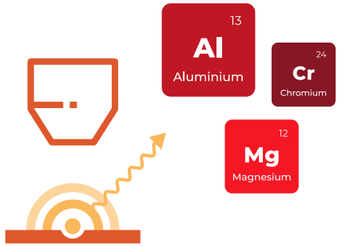
Microplasma creation

Microplasma is created from a small part of the analyzed material.

3

Elemental analysis

Microplasma radiates atomic emission lines of each individual chemical element present. Radiation is captured to get qualitative and quantitative results.



GENERAL BENEFITS
of LIBS technology

LIBS is concurrent for established techniques, such as Atomic Emission Spectroscopy (ICP-AES), Atomic Absorption Spectroscopy (AAS), X-ray Fluorescence (XRF), and Energy Dispersive X-ray Spectroscopy (EDX), which usually requires complex sample preparation, long detection time, costly operation or have limited elements coverage.

- **Speed**
  Immediate results of chemical analysis - from a fraction of a second. Up to kHz measurement repetition rate.

- **Wide element coverage**
  Most of the chemical elements can be detected, including the light ones (H, Li, Be, Mg, Na, Mg, N, O, and C).

- **Multi-elemental capability**
  All elements present are measured simultaneously without the need for the system „reconfiguring“.

- **High spatial resolution**
  Precise spot analysis with resolution from 10 µm enables detailed chemical imaging.

- **Any type of sample**
  Samples do not need to be specially prepared. Analysis of all states of matter, conductive and non-conductive materials, in any form is possible. Dirty samples can be cleaned directly with a laser.

- **Resource-efficient**
  No acids, no carrier gas, no other additional compounds required.

- **Flexibility**
  LIBS system can be designed for specific applications - even remote or in-site analysis is possible.

- **Sensitivity**
  A negligible amount of material from tens of nanograms is ablated. Limits of detection depending on sample and element of interest is 1-100 ppm.

APPLICATION FIELDS

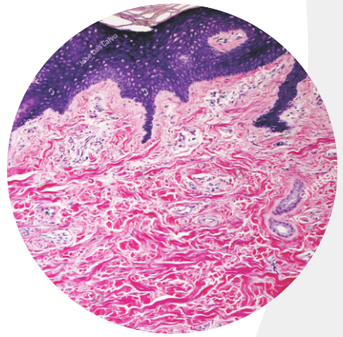
General elemental analysis
Metallic, geology, plastic, and biology/organic materials.

Elemental imaging
Surface area chemical mapping, 2d visualization of elements concentrations

Depth profiling
Analysis of multilayer materials







Examples

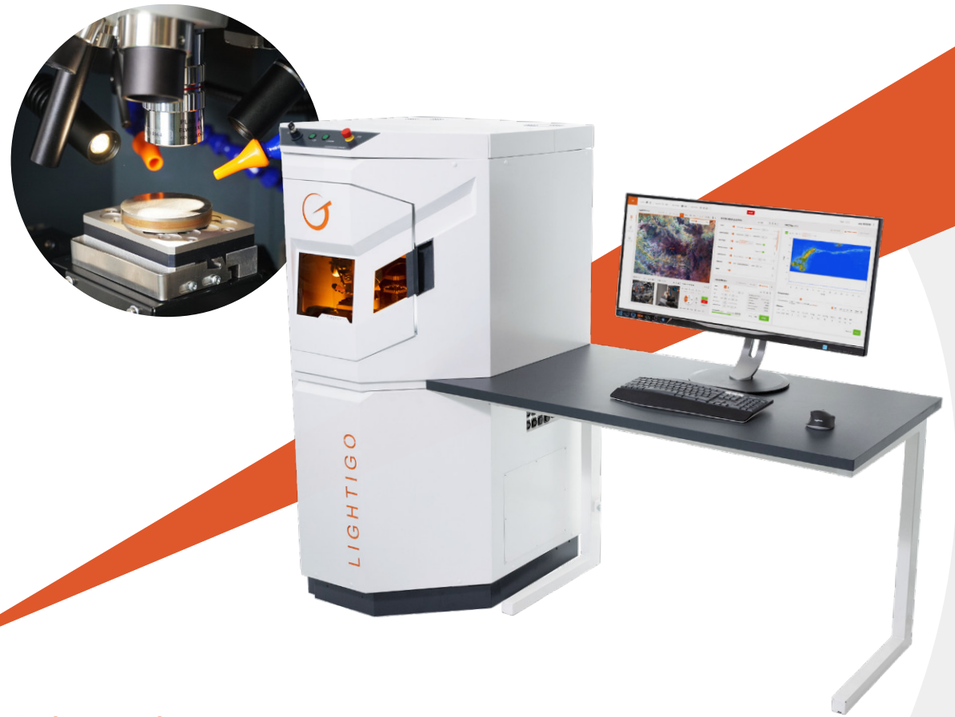
- **Steel and Al/Mg/Ti/Cu/Ni-base alloys** analysis - composition validation, quality check.
- **Analysis of coatings** - depth and type, Zinc galvanized sheet metal analysis.
- **Toxicology, toxic or heavy metals** detection in packing materials, toys, plants, waters, recycled materials, air filters, etc.
- **Microplastics detection.**
- **Fertilization process diagnostics** in agriculture, trace elements (K, N, P, ...) detection in plants, soils.
- **Tracing of biomarkers, metallomics,** nutrition elements, cancer tissue analysis
- **Homogeneity check, defectoscopy**
- **Forensic analysis** of traces and objects under investigation.
- **Cultural heritage** objects characterization.
- **Identification of minerals**, gemstone validation, conflict diamonds identification.
- **Scrap sorting recycling**, circular economy.
- **Material corrosion** state determination.
- **Special applications**: Stand-off analysis of explosives, geology samples on extraterrestrial missions, deep ocean analysis of submerged historical artifacts.

FireFly

Rapid multi-elemental analysis

FireFly brings you the Laser-induced Breakdown spectroscopy - one of today's most promising methods of elemental analysis.

FireFly is a laboratory analytical instrument specialized in rapid multi-elemental chemical imaging of solid samples of various types - metalic, geology, plastics, and biology/organic.



Basic characteristics

- **Sample type: Solids**
- **Microscopy sample view with dual illumination**
- **Measurement area: 100×100 mm²**
- **Movement resolution: <1 µm**
- **Spatial resolution of analysis: from 10 µm**
- **Measurement rate up to 100 Hz**
- **Spot / Line / 2d map analysis**
- **Limits of detection: from units of ppm**

Special hardware features

- **Multiple objectives, motorized switching**
- **Motorized laser spot size changing.**
- **Motorized laser wavelength selection (1064/532/266 nm)**
- **Laser pulse energy regulation and monitoring**
- **Vapour extraction module**
- **Inert gas purge module**
- **Synchronization BNC output**

Software features

- **Automated laboratory log**
- **User accounts, multiple roles**
- **Measurement profiles**
- **Step by step guides**
- **NIST and Lightigo line database**
- **Sample view controls**
- **Spectra manipulation, statistics**
- **Interactive multi-layer chemical map creation**
- **Data export**

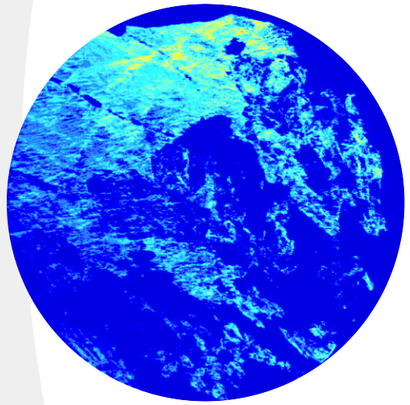
CHEMICAL IMAGING

A chemical image, also known as a chemical map, shows the distribution of the desired element in some region/area of the sample. The concentration or detected intensity of a given element is represented by the artificial color gradient thus creating the form of map.

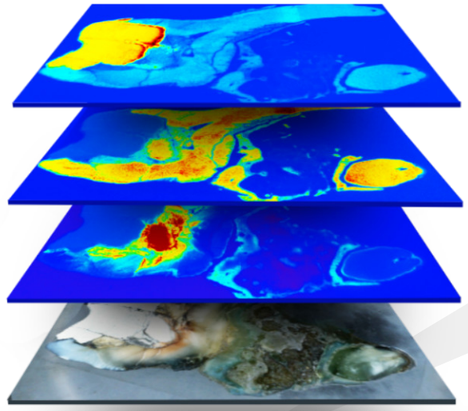
Chemical maps are efficient tool for visualisation of the heterogeneity of the sample, distribution of the impurities, detecting boundaries, tracing the markers, minor elements, etc.

FireFly has a number of benefits, which makes him a perfect tool for creating chemical maps:

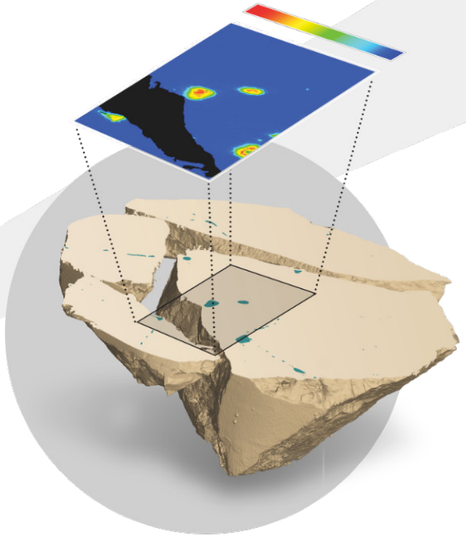
- FireFly can do fast mapping with repetition rate up to 100 Hz thus creating large-area maps 2 order of magnitude faster than competitive techniques.
- FireFly can reach high spatial resolution down to 10 µm thus creating detailed images.
- FireFly performs multi-elemental analysis, the resulting chemical map can be redrawn for a different element instantly.
- FireFly can resolve individual depth layers of the materials thus creating multi-layer chemical maps.



Distribution of **Li** within the White Spodumene mineral.



Multi-layer chemical map of **Hg**, **Ca** and **Mg** in human teeth cut.



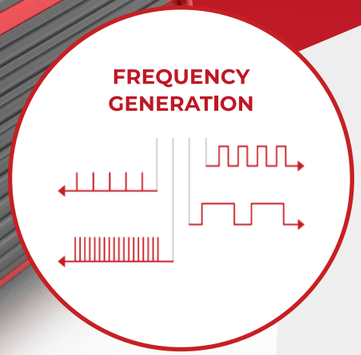
Chemical map of **Pb** distribution in Galena stone.

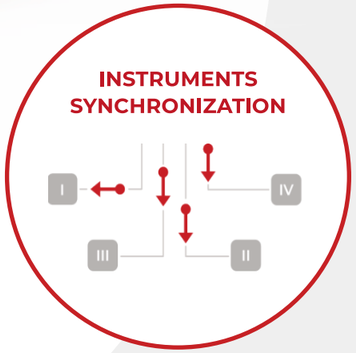
SyncRay

Your nifty box
for precise
synchronization

Precise LIBS analysis requires precise synchronization. SyncRay is compact Digital Pulse Generator - an efficient tool for multichannel frequency generation or multiple instruments synchronization.

SyncRay is filling the gap between the cheap DDGs, which might lack important features and more advanced DDGs, which are too big and/or too expensive.





Parametres

Basic parametres:

- 4 Output + 1 Input/Output Channel
- Input as Trig/Gate/External ARM
- SMB connectors for easier handling
- Resolution 10 ns, precision 5 ns
- Switchable output level 3.3/5 V

Time base sources:

- Internal (0-5 MHz)
- External/Triggered (0-5 MHz)

Time base modes:

- Single, Continuous, Burst, Duty Cycle

Time base features:

- Gated (Active low, Active high)
- External Trigger (Threshold Level, Rising edge, Falling edge)

Chanel base modes:

- Normal, Single shot, Burts, Duty cycle

Channel features:

- Pulse width, Pulse delay
- Changeable Sync source
- Channel multiplexing
- Wait count
- Gated mode

Other parametres:

- USB connection
- Aluminum box, 130×75×190 mm
- Weight: 1 kg
- Power supply: 5-24 V DC jack

3-axes Motorized Stage

Micrometer precision and automated features

Do not waste your time with the manual sample movement, which is slow, inaccurate, and hardly repeatable.

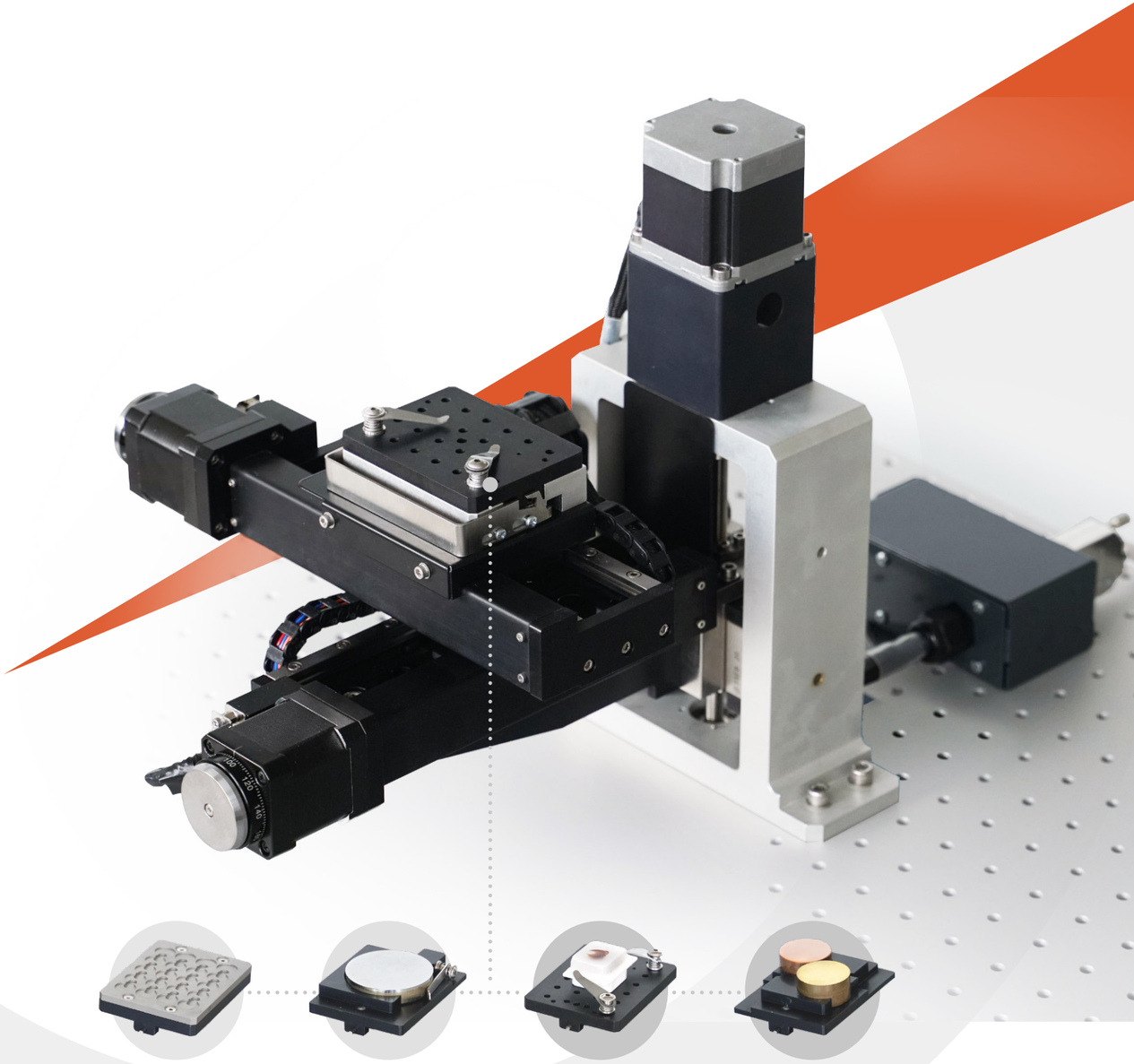
3-axis motorised stage is beneficial for any application where frequent sample movement is required: optical microscopy, analytical techniques (Raman, LA-ICP, XRF, LIBS, ...), material processing methods, and many others.

Key parameters

- **Travel range: X×Y×Z: 100×100×50 mm**
- **Step resolution: <1 µm**
- **Bi-directional repeatability (RMS): ±0.40 µm**
- **Attachable to an optical breadboard**
- **C++ control libraries for OEM integration**

Software features

- **Relative / absolute movement to a coordinate**
- **Automated movement to series of coordinates for mapping (chemical imaging)**
- **Batch import / export coordinates**
- **Wait time and Trigger-out after reaching set**



WHY LIGHTIGO?

Elemental analysis in a fast, easy and efficient way - that's what we bring to our customers. That's why we develop instruments based on Laser-induced Breakdown Spectroscopy - young but proven analytical techniques that we have devoted to the last 20 years of our research and development activities.

Our primary goal are satisfied customers. Customers who benefit from the speed, simplicity, and adaptability of the LIBS technology. A technique that gives you more analytical options and makes your analysis much easier.

Lightigo is a technology company with roots in the scientific ground. Its founding members established a recognized research group at the Central European Institute of Technology (CEITEC). A group with countless articles related to LIBS in scientific journals (Sensors, Spectrochimica Acta Part B, Optical Engineering, ...), with successful international grant collaboration in both academic and industrial fields.

In our instruments, we have transformed our rich LIBS knowledge into fast, accurate, and reliable devices. Close cooperation with the LIBS research group at CEITEC allows us to constantly improve the technology and equipment in connection with the latest trends in the field of LIBS.

Instruments for multi–elemental analysis
and chemical imaging based on LIBS and developed by us

Free test measurements
of your samples

Routine elemental analysis

Consulting
in the field of LIBS

Custom development
for your application

Cooperation in R&D
projects and grants

LIGHTIGO

LIGHT UP YOUR ANALYSIS

Lightigo s.r.o.
Renneská třída 329/13
Štýřice, 639 00 Brno
Czech Republic

VAT: CZ02731410

info@lightigo.com

www.lightigo.com