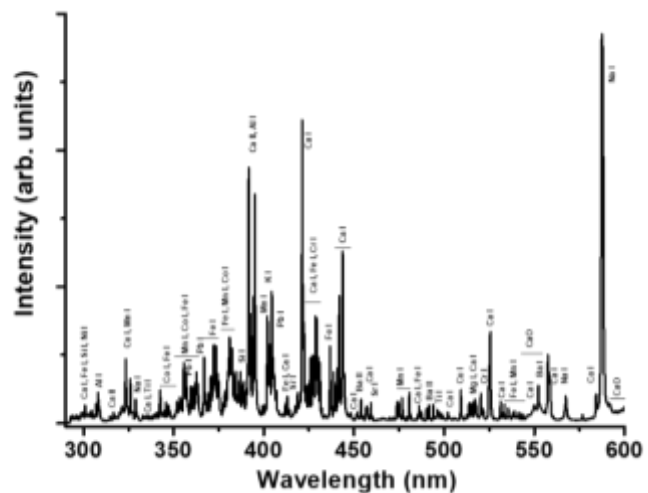


## FIXLAB

### LLHS, IQFR-CSIC. Laser Induced Breakdown Spectroscopy (LIBS)

#### Description



*Talanta 230 (2021) 122314.*

Laser-induced breakdown spectroscopy (LIBS) is a type of atomic emission spectroscopy which uses a highly energetic laser pulse as the excitation source. LIBS is based on the spectral analysis of the luminous plasma plume that is generated upon pulsed laser ablation of a minute quantity of material from the surface of the sample. The formation of the plasma begins when the focused laser achieves a certain threshold for optical breakdown, which generally depends on the environment and the target material. LIBS is a minimally invasive technique with stratigraphic capability, common in many applications including cultural heritage, that provides qualitative, semi-quantitative and quantitative information on the elemental composition of the sample materials.

#### Fields of application

##### Cultural Heritage

Archaeological object, architecture, art, decorative arts, film, mosaics, painting, sculpture, textile

##### Natural Heritage

Fossil, mineral, shell, skeleton

#### Materials

##### Inorganic

Ceramic (clay/mud brick/terracotta/earthenware/stoneware/porcelain), glass, stone, metal and metallurgical by-products, pigment

##### Organic

Binding media, glues, wood, paper, textiles, varnishes

## Equipment

The LIBS instrument is based on laser excitation with a Q-Switched Nd:YAG laser (LS-2147, Lotis II) operating at the fundamental wavelength (1064 nm) and its harmonics of 532, 355 or 266 nm, at a repetition rate of 10 Hz and delivering pulses of 17 ns with Gaussian-like spatial profile. The linearly polarized laser beam is directed to the surface of the sample by means of dichroic mirrors. For LIBS measurements, and to increase the laser fluence values above the ablation threshold of the material analysed, the laser beam is focused with a quartz lens placed in front of the sample. The laser spot size and pulse energy are adjusted to their lowest possible values, to achieve the maximum superficial resolution, to avoid sample damage and to obtain spectra with a high signal-to-noise ratio. The LIB spectra are recorded using a time-gated intensified charge-coupled device (ICCD) camera (Andor Technology, iStar CCD 334, 1024×1024 active pixels, 13 μm x 13 μm pixel), coupled to a 0.2 m Czerny-Turner spectrograph (Andor, Shamrock Kymera-193i-A) equipped with different gratings.

## Potential Results

Characterization of the elemental composition of different types of cultural heritage materials and identification of stratigraphies.

## References

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- Multiphoton Excitation Fluorescence Microscopy and Spectroscopic Multianalytical Approach for Characterization of Historical Glass Grisailles. Oujja M., Agua F., Sanz M., Morales-Martin D., García-Heras M., Villegas M.A., Castillejo M. *Talanta* 230 (2021) 122314.
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- Laser induced breakdown spectroscopy for analysis and characterization of degradation pathologies of Roman glasses. Palomar T., Oujja M., García-Heras M., Villegas M.A., Castillejo M. *Spectrochim. Acta B.* 87 (2013) 114-120.

## Sample or service requisites

- Samples with a size equal to or greater than 3 mm x 3 mm.

For further details please contact the provider

## Provider



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