

Laser Laboratory for Heritage Science

KEYWORDS

- Laser
- Characterization
- Diagnosis
- Conservation
- Heritage Materials

POTENTIAL END USERS

Companies and institutions for the restoration and conservation of heritage, museums, instrumentation companies, and others.

TECHNIQUES

- Laser induced fluorescence (LIF), laser induced breakdown spectroscopy (LIBS), and Raman spectroscopy.
- Nonlinear optical microscope in the modes of Multi-Photon Excited Fluorescence, and Second and Third Harmonic Generation.
- Pulsed laser ablation and vaporization.
- Laser processing of nanostructured substrates for conservation and sensing.

Characterization, diagnosis and conservation of tangible heritage by laser-based techniques

Need or problem that solves

The restoration and conservation of tangible heritage often require non-destructive techniques and non-invasive analysis methodologies with high spatial resolution. The Laser Laboratory for Heritage Science (LLHS) offers new analytical strategies specifically tailored for Heritage Science applications based on the use of laser methods to:

- Determine the elemental and molecular composition of heritage materials and to evaluate the changes induced by degradation processes.
- Characterize non-invasively in three dimensions (3D), with micrometer accuracy the structural and chemical composition of materials by applying laser spectroscopies or non-linear optical microscopy.
- Remove unwanted aged or dirt layers constituted by pollution or degradation materials, or previous overpaint layers, by using pulsed laser processing.
- Fabricate nanostructured substrates for conservation and sensing devices by advanced laser processing techniques.

Innovative Aspects

The above techniques:

- Are minimally or non-invasive, with resolution in the micrometre scale.
- Allow the morphological, structural and chemical characterization in 3D of complex structures (determination of thickness, crystallinity, composition of different materials or layers).
- Can be used for in-situ sample characterization and can be developed as portable instruments for diagnosis and conservation without sampling.



Equipment

- Nanosecond and femtosecond pulsed lasers emitting from the UV to the NIR.
- Light spectral selection and detection components, motorized translation XYZ stages with micrometre accuracy.
- Laser Induced Breakdown Spectroscopy (LIBS) system.
- Hybrid transportable Raman-Laser Induced Fluorescence (LIF)-LIBS system.
- Nonlinear optical microscope working in the imaging modes of Multi-Photon Excited Fluorescence, and Second or Third Harmonic Generation.
- Access to complementary techniques for physical-chemical characterization.

Contact

Laser Laboratory for Heritage Science
 Instituto de Química Física Rocasolano
 Marta Castillejo Striano
marta.castillejo@iqfr.csic.es
[Web](#)

