

LIBSlab

Chemical multi-elemental analysis with LIBS in modular benchtop design



Why LIBS?

- Qualitative and quantitative multi-elemental analysis
- For solid, liquid and gaseous samples
- Almost non-destructive
- No sample preparation necessary
- Short measurement times
- Sample mapping

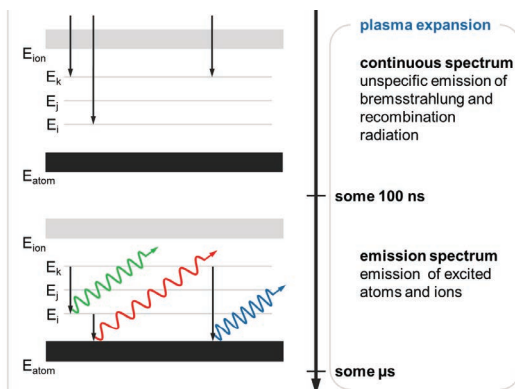
The LIBSlab is a compact and easy to use measuring instrument for the qualitative and quantitative multi-elemental analysis by means of laser-induced breakdown spectroscopy (LIBS). Due to its modular design, the LIBSlab provides individual configuration options to meet your requirements for a flexible use of LIBS technology in the scientific and industrial sectors.

LIBS technology

Laser-induced breakdown spectroscopy (LIBS) is a type of atomic emission spectroscopy, utilizing laser ablation and the subsequent atomic emission from the generated plasma for elemental analysis. Laser ablation is at present the only analytical method that offers direct sampling from any kind of material (solids, liquids, gases) without sample preparation. Short pulse laser radiation that is focused on the surface of a sample causes a local heating of some 10,000 °C and leads to the generation of a light emitting plasma - consisting of atoms and ions of the ablated material. The spectral analysis of characteristic atomic and ionic emission lines allows the determination of the atomic composition of the sample.

4 modules = LIBSlab

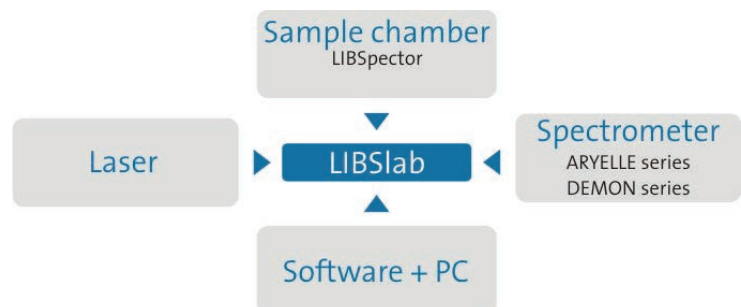
By individually combining and customizing the 4 modules - sample chamber, spectrometer, laser as well as software and PC - the LIBSlab can easily be adapted to customer needs, thus opening a wide range of applications.



Scheme of a typical LIBS plasma process.

Applications

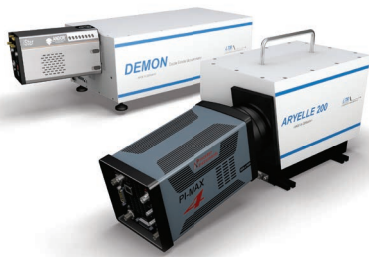
- Laboratory measuring instrument
- Quality control
- Material characterization
- Scientific and industrial applications



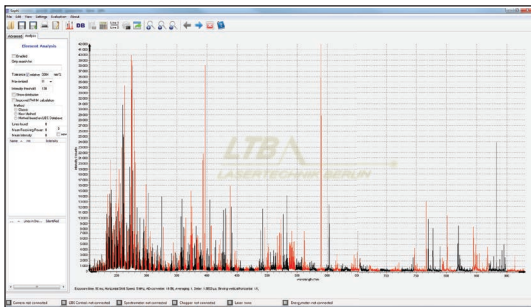
Modular hardware and software components of the LIBSlab.



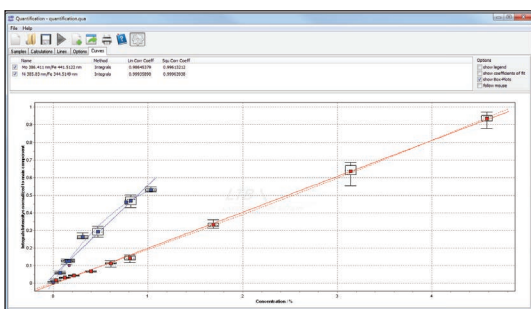
LIBSpector – compact sample chamber for the LIBS analysis of solid, liquid and gaseous samples.



High-resolution echelle spectrometer series ARYELLE and DEMON made by LTB Lasertechnik Berlin.



User interface of the operating and evaluation software Sophi.



Calibration curves for quantitative analysis.

Sample chamber

The LIBSpector is a compact sample chamber for the LIBS analysis of solid, liquid and gaseous samples. It comes with a laser class 1 housing and is equipped with safety interlock, laser protection window for observation and exhaust flange for safe use. No additional laser safety precautions are therefore required at installation site. The beam of the laser, whose head can be incorporated in the chamber housing, is directed to the sample via telescope optics and generates a light emitting plasma. The plasma light is guided to the spectrometer via mirror and fiber optics. Sample mapping is provided by an integrated motorized and software-controlled XYZ stage. For precise sample positioning and focusing, a pilot laser and a real-time video monitoring based on a high-resolution CMOS camera are installed. Several sample holders for solid, liquid and gaseous substances provide universal application capability and can be adapted to your individual requirements.

Spectrometer

All spectrometers made by LTB Lasertechnik Berlin are based on a dispersion unit with echelle grating and prism and feature high-spectral sensitivities and excellent imaging qualities. The LIBS emission spectrum of a sample can be measured simultaneously from the UV to the NIR range by using a high-resolution spectrometer from the ARYELLE and DEMON series. In combination with different CCD-, EMCCD-, ICCD- and CMOS-detectors the spectrometers provide a wide range of customer applications.

Laser

For plasma generation, various Nd:YAG and excimer lasers with different wavelengths and pulse energies can be applied. The choice of the optimal LIBS laser setup depends on your individual application and can be made by yourself. Many years of experience gained with diverse laser types and manufacturers enable us to give you competent advice.

Software and PC

The operating and evaluation software Sophi developed by LTB Lasertechnik Berlin provides access to all device functions of the spectrometer-detector unit, the LIBSpector and laser via notebook or PC-based user interface. After transforming the detector information into wavelength-dependent intensity values, all lines of the gained LIBS spectrum are automatically analyzed with the integrated NIST atomic data base and qualitatively assigned to the corresponding elements. For quantitative multi-elemental analysis of unknown samples, calibrations with reference materials are a precondition. The implemented script-based control allows the automatization of recurring measuring and evaluation procedures and provides you maximum flexibility. Recalibration of the wavelength scale of the spectrometer-detector unit are easily performed with the auto-calibration function by using the included mercury lamp.