Laser Induced Breakdown Spectroscopy

Reliable, Repeatable Identification and Analysis

LIBS technology is a powerful tool for rapid, real-time elemental analysis. With LIBS, there is virtually no sample preparation, excellent portability, real-time results and sensitivity down to parts-per-million and picogram levels.

With recent advances in broadband spectral detectors, LIBS is capable of detection and identification of a comprehensive range of metal and gemological materials, as well as biological and chemical agents, hazardous materials and more.

The application areas of LIBS are growing dramatically. From environmental monitoring to materials analysis and from forensics to pharmaceuticals, LIBS fits the bill when simple and straightforward techniques are required.

LIBS Benefits

- No sample preparation
- Very small samples required
- Trace element detection possible
- Modular and turnkey options available

LIBS Comparison to Other Technologies

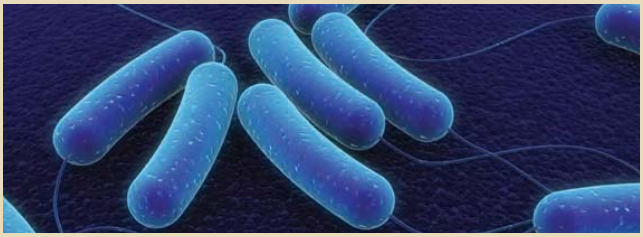
Parameter	LIBS	SEM/EDS	XRF	LA-ICP-MS	EPMA
Sample depth:	~50-100 µm	~5 µm	~100 µm	~80 µm	<1 µm
Sensitivity:	10-50 ppm	1000 ppm	100 ppm	<1 ppm	100 ppm
Precision:	Fair-good	Poor	Fair-good	Excellent	Fair
Accuracy:	Semi-quantitative	Qualitative	Semi-qualitative	Quantitative	Semi-quantitative
Analysis time:	Fast	Slow	Very slow	Slow	Slow
Sample consumption:	Almost non-destructive	Non-destructive	Non-destructive	Almost non-destructive	Non-destructive
Complexity:	Easy to use	Easy to use	Complicated	Complicated	Complicated
Discrimination:	Good	Poor	Good	Excellent	Fair

Application Note

LIBS for Defense

In an earlier LIBS application, closely related spores of the genus Bacillus were deposited on silver membrane filters for analysis using broadband Laser Induced Breakdown Spectroscopy. The observed spectral differences among the spores – Bacillus subtilis, Geobacillus stearothermophilus and Bacillus pumilus – provide evidence of the power of LIBS in resolving complex biological samples.

The presence of the spores' unique spectral lines, as well as different combinations of spectral lines, provide many opportunities for discrimination. While most of the unique peaks occurred in the G. stearothermophilus spectrum, spectral differences were observed in the spectra for all spores. Spore characteristics, such as surface profile and coat mineralization, may account for these differences.



The results reported for the Bacillus spores, along with others obtained for biological molecules (including nucleic acids and proteins), provide exciting evidence of the discriminating capability of Ocean Optics' LIBS systems.