

Laser-Induced Breakdown Spectroscopy

Rapid elemental analysis for solids, liquids, and gases

ORNL develops LIBS tools to deliver rapid, dependable analysis of solids, liquids, gases, and mixed-phase materials, integrating fundamental research with innovation for complex and hazardous environment measurements.

CHALLENGE

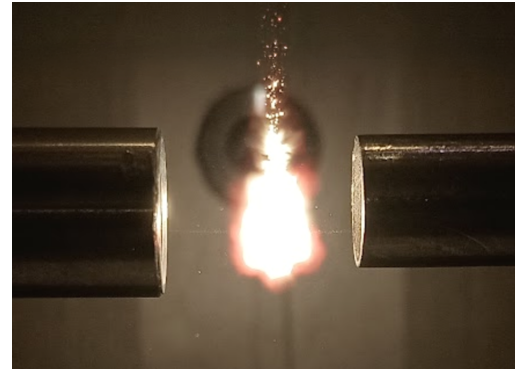
Scientists need accurate, real-time elemental analysis in complex and hazardous environments where traditional instruments struggle. ORNL develops LIBS approaches that deliver fast, reliable measurements of solids, liquids, gases, and mixed-phase samples while overcoming matrix effects, signal variability, and environmental challenges. Emerging missions also demand higher throughput, sensitivity, and improved isotopic capability.

APPROACH

- Develop novel LIBS approaches for rapid, reliable analysis of solids, liquids, gases, and mixed-phase samples.
- Engineer systems that operate in complex or hazardous environments with minimal user intervention.
- Mitigate matrix effects and signal variability through improved modeling, calibration, and data processing.
- Push performance in throughput, sensitivity, stability, and isotopic capability to meet emerging mission needs.

IMPACT

- Provides fast, dependable chemical measurements in places too difficult or dangerous for traditional tools
- Improves real-time decision-making for complex processes through fast, robust elemental measurements
- Expands analytical capability to mixed-phase and challenging samples with enhanced accuracy and stability
- Advances where and how people make chemical measurements, opening new possibilities for science and industry

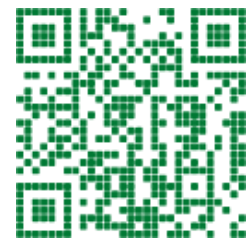


LIBS plasma of molten salt aerosols

Research Focus

The ORNL LIBS team provides specialized approaches for rapid elemental monitoring in complex and hazardous samples/environments.

- Molten salt reactors
- Radioisotope production
- Fusion reactor blanket
- Geological samples



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