Fundamentals and Novel Applications of Laser Induced Breakdown Spectroscopy (LIBS)

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Laser Induced Breakdown Spectroscopy (LIBS) [1-2] is a field-deployable analytical technique for the determination of elemental composition of chemical and biological materials in real-time.

In LIBS, high-power laser pulses of tens to hundreds of millijoule energy are focused onto a small area so that a very small amount of sample, in the range of nanograms to picograms, gets easily vaporized, atomized, excited and ionized by generating luminous plasma. Plasma emission is collected by suitable optics and detected by modern spectroscopic instrumentation. Analysis of the spatially and temporally resolved plasma spectrum reveals information on chemical species composition and relative abundance.

LIBS has many advantages over conventional atomic emission spectroscopy techniques with the ability to analyze all types of samples (solid, liquid and gaseous form) in-situ, without the need for sample preparation. Although the LIBS method has been known for 40 years, the interest was mainly on understanding the physics of the plasma formation prior to 1980. LIBS has been extensively studied for environmental, industrial, geological, planetary, security, art and medical applications, since the early 1980’s.

In this presentation, past and current status of fundamental and applied LIBS studies in the field of Analytical Chemistry will be overviewed.

References