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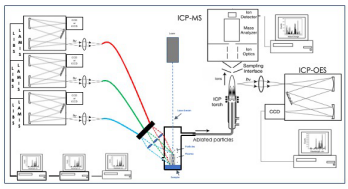
MULTI SENSOR LASER ABLATION ANALYSIS OF COMPLEX SAMPLES: DATA FUSION



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In the analyses of highly-complex heterogeneous samples, such as rocks a single analytical technique might not have the sensitivity, resolution, or selectivity to determine its multi-elemental composition. Similarly, a single analytical technique, typically, is insufficient to specify the molecular, elemental, and isotopic compositions. In most cases, a combination of analytical techniques is needed to obtain a complete picture of the composition and other defining characteristics. This approach involving multiple analytical techniques and instrument capabilities allows for a more comprehensive sample composition representation.The first one of these two techniques employed simultaneously is known as Laser-Induced Breakdown Spectroscopy (LIBS). LIBS is a versatile technique for direct elemental analysis of samples (liquid, gas, or solid) and is based on optical emission spectroscopy measurements expressed as atomic and ionic emission lines. The second is Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). LA-ICP-MS is a powerful analytical mass spectrometry technique that enables highly sensitive elemental and isotopic analysis to be performed directly on solid samples. Measurements are typically based on the mass-to-charge ratio or time-of-flight of ions, depending on the type of mass spectrometer utilized. These two techniques yield complementary information. Individually LIBS and LA-ICP-MS possess several distinctive characteristics [1,2]. LIBS has been recognized for its unique advantages of fast, in-situ, multi-elemental analysis from H to Pu. Coupling laser ablation with ICP-MS-based instruments provides additional isotopic information and enhanced sensitivity when compared to LIBS alone. Analysis taking advantage of these two techniques simultaneously can be advantageous, as every laser pulse for ablation provides both the optical plasma for emission spectroscopy and the particles for ICP mass spectrometry. Data fusion is defined as a method that combines data sets from different sources (techniques or sensors) to produce a single data set for building analytical models. In contrast, combined data from multiple techniques or sensors can offer a more complete representation of the sample composition

We will give a short overview of the Laser Ablation tandem capabilities and data fusion resulting from the analysis from these two techniques.

1.Dong, M. *et al.* Coal . *Anal Chem* **92**, (2020).

2.Oropeza,D. *et al. Applied Spectroscopy* **73**, (2019).