

## **Femtosecond Laser Ablation-Time of Flight Inductively Coupled Plasma Spectrometry (fs-LA- ICP-(TOF)MS) for Elemental Analysis of Fluid Inclusions.**

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Mineral may incorporate tiny droplets of fluids while they crystallize, these fossil samples can provide direct information of the environmental conditions presented during the growth of minerals. LA-ICP-MS is the commonly technique used to quantify trace elements in these fluid inclusions thanks to the excellent analytical figures of merits: multielement analysis capability, including stable isotopes measurements, precision below 3 % expressed as RSD and limits of detections below 1 mg/kg. Fluid inclusion analysis are usually carried out by drilling in one location of the mineral until the inclusion is reached, meanwhile the ablated material is transported into an ICP-MS for chemical analysis.

In this work we evaluated the analytical performance of a high repetition rate fs-LA-ICP-(TOF)MS system for the analysis of different quartz fluid inclusions. Specifically, it was studied the analytical benefits of different ablation modes for quantification purposes. The combination of high repetition rate fs-laser with ICP-(TOF)MS was selected because of its attractive characteristics, among these are: fs- pulses induce a small heat effect region in the sample; fs-LA produces fine aerosol size; and the TOF system is a fast speed simultaneous mass analyser that may collect the entire mass spectrum in less than 30  $\mu$ s which is ideal for multielemental transient signals produced by the fluid inclusions.

The experimental system included a LA system (J100 Applied Spectra, Inc.) coupled to an ICP-(TOF)MS (GBC Scientific Optimass 9000). Results show that high speed raster ablation mode with the femtosecond laser allows a better identification and integration of the fluid inclusion signals thanks to a better release of the particles in the ablation process when compares to the multiple continuous shots pattern.