

ICP-Base: A new approach to LA-ICP-MS data reduction

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Transient mass spectrometry data, especially since the advent of Laser-Ablation Inductively-Coupled-Plasma Mass-Spectrometry (LA-ICP-MS), have become a standard tool in petrology and geochemistry to extract chemical information from geological materials. Most commonly used software to quantify raw mass spectrometry data are often inflexible, expensive, and closed-source, limiting control on advanced data evaluation and reduction and, more broadly, impeding innovation. Furthermore, they mostly provide only tabular output (e.g., spreadsheets), requiring users to laboriously evaluate, compare, and visualize their results in separate applications.

To ease these limitations, we are developing the free and open-source software ICP-Base. It features a Graphical User Interface (GUI) designed to maximize user-friendliness, control, and efficiency during data reduction of LA-ICP-MS spot analyses. In addition to solids analyses, it introduces novel approaches for quantification of liquid or solid inclusions fully enclosed in minerals. Additionally, a powerful Application Programming Interface (API) is enabling advanced users to customize and extend the software for their own needs.

Multiple raw mass spectrometry datasets can be imported and are stored in an accessible data structure, organized in projects. These raw data can then be processed in a linear workflow employing multiple modules, each of which can later be edited separately. ICP-Base can handle multiple external standards simultaneously, allowing for parallel drift correction and user-defined quantification of a given spot measurement. This allows for a new and highly dynamic sequential quantification process that iteratively builds on previously calculated results.

The centralized data repository makes it possible to easily and quickly compare secondary and in-house reference materials results to published values and to previous measurements. Furthermore, LA-ICP-MS signals and results can be statistically evaluated and visualized using highly customizable plot styles, enabling users to efficiently produce publication-ready figures.

We will demonstrate the capabilities of ICP-Base using LA-ICP-MS data, showcasing the full range of functionalities, including diverse strategies of data quantification, evaluation, visualization, and comparison.