

Advancing Quantification in LA-ICP-MS: A Volume-Corrected Approach and Its Application Across Nano- and Femtosecond Laser Ablation Systems

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In recent years, significant advancements in LA-ICP-MS technology have led to improvements in throughput, sensitivity, and image quality. However, precise quantification remains a persistent challenge, primarily due to the difficulty of obtaining matrix-matched standards, which are essential for accurate calibration. These standards, designed to closely resemble the composition of the sample, are often unavailable, hindering reliable quantification.

To address this challenge, we have developed an innovative approach to improving quantification in LA-ICP-MS by independently measuring the volume ablated in a separate experiment. This volume-based correction method accounts for variations in material properties and enables accurate signal correction, provided that fluence settings are appropriately adjusted. By applying this approach, precise quantification can be achieved even when matrix-matched standards are not available.

Additionally, we will compare this volume-corrected calibration approach across different laser ablation systems, specifically nano- and femtosecond lasers. Understanding how ablation characteristics vary between these systems is crucial for refining quantification strategies and ensuring reproducibility across different instrumental setups.

In this presentation, we will discuss this approach in detail, highlighting its advantages and demonstrating its effectiveness through practical examples. While this method may not yet provide a definitive solution, it represents a significant step forward in addressing one of LA-ICP-MS's most persistent challenges—a necessary step toward more reliable and flexible quantification.