

Determination of Trace Elements in Soda-Lime Glass Samples Using Laser Ablation Inductively Coupled Plasma Mass Spectrometry for Forensic Comparisons



WHAT IS AN AAFS STANDARD FACTSHEET?

The AAFS produces clear, concise, and easy-to-understand factsheets to summarize the contents of technical and professional forensic science standards on the OSAC Registry. They are not intended to provide an interpretation for any portion of a published standard.

WHAT IS THE PURPOSE OF THIS STANDARD?

The elemental composition between glass samples can vary widely. As such, measurement of the elemental composition of glass samples can be conducted to determine if two or more glass fragments could have originated from the same common source.

This test method provides a procedure for the quantitative measurement of seventeen elements using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). This technique is sensitive from the low part per million (ppm) to percent (%) level concentrations.

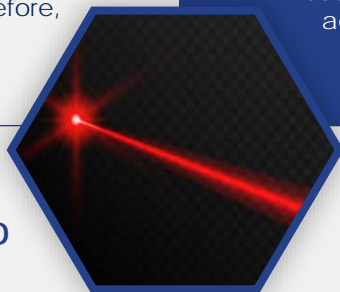
This method consumes approximately 0.4 to 2 micrograms of glass per analysis and is, therefore, suitable for small, irregularly shaped glass fragments like those often encountered in forensic glass examinations.

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

This standard describes procedures for the collection of precise measurements of specific elements in glass using LA-ICP-MS.

Mandates for instrument calibration frequency, as well as quality control analyses are dictated within the standard. This ensures reliable and accurate data will be collected from forensic evidence.

The detailed procedure for sample preparation and data acquisition, including replicate measurements, ensures that samples are adequately characterized.



HOW IS THIS STANDARD USED, AND WHAT ARE THE KEY ELEMENTS?

This test method provides an objective approach for quantitatively measuring the concentrations of seventeen elements in glass samples using LA-ICP-MS. It is intended for the comparison of glass fragments for forensic purposes and is reported to be highly discriminating. Other elemental analysis techniques for forensic glass and the strengths and limitations relative to LA-ICP-MS are described.

A procedure for calculation and interpretation of the results is provided. To assist with interpretation, the limits of detection (LOD) and limits of quantification (LOQ), obtained from an interlaboratory study on the use of LA-ICP-MS in glass analyses are included in the standard.

The standardized approach to quantitative elemental analysis of glass by LA-ICP-MS means that the data can be compiled into a database and referenced to assist with the interpretation of common or uncommon elemental compositions.

Forensic examination of glass often includes characterization and measurement of multiple properties (e.g., color, density, refractive index, and elemental composition). LA-ICP-MS is consumptive producing minimal destruction of the sample; therefore, this technique is often placed at the end of analytical schemes.

