

## Forensic Comparison of Glass Using Micro X-ray Fluorescence ( $\mu$ XRF) Spectrometry



### 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 compositions of glasses is a useful characteristic to evaluate when trying to determine if multiple glass fragments originated from a common source.

Micro X-ray fluorescence spectrometry ( $\mu$ XRF) provides a technique for simultaneously measuring the major, minor, and trace elemental constituents of glass samples. This technique is applicable to small samples, like those typically encountered in forensic investigations.

This test method presents two reliable approaches to the interpretation of  $\mu$ XRF spectra. Qualitative analysis includes identifying which elements are present in a sample, and Semi-Quantitative analysis involves the evaluation of peak ratios between elements commonly found in glass.

### WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

This standard describes procedures for the preparation and analysis of glass fragments by  $\mu$ XRF spectrometry to ensure the acquisition of high-quality data for forensic comparisons.

Quality assurance thresholds for  $\mu$ XRF spectrometry performance are presented in the standard. Adherence to this test method ensures that forensic science service providers will achieve reliable  $\mu$ XRF data for glass evidence.

Following a standard test method for determining elemental ratios of glass samples allows results to be tabulated into a reference library, providing an ever-expanding resource to aid in data interpretation.

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

This test method provides a procedure for objectively measuring the elemental composition of glass fragments using  $\mu$ XRF spectrometry as well as a method for interpreting the data in the confines of a forensic glass comparison.

Procedures for assessing instrument calibration and standardization are provided. This ensures a minimum level of performance is reliably achieved, allowing for critical evaluation and interpretation of the data.

The results of interlaboratory studies for determining the precision of  $\mu$ XRF spectrometry of glass are provided in the document. This provides a starting point for determining the reproducibility of  $\mu$ XRF data collected and assessing if the results are fit for forensic comparisons.

Forensic examination of glass can include characterization and measurement of multiple properties (e.g., color, density, refractive index, and elemental composition).  $\mu$ XRF spectrometry is a non-destructive technique that can be applied at any point in an analytical scheme without worry about sample alteration or destruction.

