FACTSHEET FOR ANSI/ASTM STANDARD GUIDE E3295-23

Using Micro X-Ray Fluorescence (μ-XRF) in Forensic Polymer Examinations

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?

This standard guide covers recommended techniques and procedures for forensic science practitioners (FSPs) that perform μ-XRF analysis on polymer samples.

Guidance is given on the application of μ-XRF systems equipped with either mono- or poly-capillary optics and an energy dispersive X-ray detector (EDS).

This guide is intended to be applied within the scope of a broader analytical scheme (for example, ANSI/ASTM E1610-18, ANSI/ASTM E3260-21) for the forensic analysis of a polymer sample.

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

The determination of a sample's elemental composition by μ-XRF can be used to compare components of polymeric materials (for example, tape backings, tape adhesives, and paint layers).

Comparisons of X-ray spectra acquired from polymer samples can provide additional information regarding the potential relationships between the sources of polymeric materials.

This guide provides information on sample, instrumental, and general μ-XRF limitations.

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

This standard guide is intended for use by competent FSPs with the requisite formal education, discipline-specific training, and demonstrated proficiency to perform forensic casework.

μ-XRF is a nondestructive qualitative elemental analysis technique. The μ-XRF data collected from polymers is limited to specific information (for example, elements detected, relative elemental abundance); additional analytical procedures are required to further characterize and identify the chemical composition of the polymer samples.

Sample handling and preparation, instrument operating conditions, spectral data collection, evaluation, and interpretation, and documentation are addressed in the guide.

μ-XRF spectral comparison is one part of a multi-analytical comparative approach. Exclusionary differences observed in XRF data can distinguish the sources of compared samples without requiring additional analytical techniques. However, an overall opinion that sources are indistinguishable is only reported when no exclusionary differences are observed in any of the analytical techniques that were applied.

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