

## Using Scanning Electron Microscopy/Energy Dispersive X-ray Spectroscopy (SEM/EDS) 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?

Scanning electron microscopy (SEM) with energy dispersive X-ray spectroscopy (EDS) is used by forensic science service providers to characterize a range of materials. Specific to polymers, SEM can be used to visualize the layer structure of multi-layered materials, such as paint, or examine the texture of materials. EDS is used to determine the elemental composition of a sample.

The SEM/EDS characteristics of polymeric materials can be compared to each other in a forensic context to determine if two or more items of evidence could have originated from a common source.

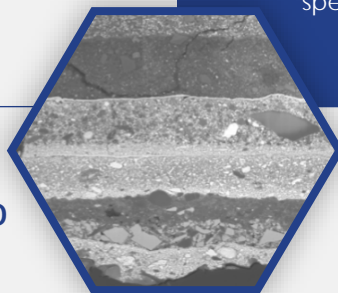
This guide discusses multiple sample preparation techniques, instrument-specific parameters and operating conditions, and data interpretation methods.

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

Adherence to this guide promotes the use of reliable sample preparation approaches in the SEM/EDS analysis of multi-layered polymeric materials (e.g., paint and tape).

Generalized procedures and the associated limitations for the sample preparation techniques are provided in this guide.

A discussion of spectral interpretation and data comparison is provided for the EDS portion of this method. Spectra collected under similar conditions are compared and interpreted for spectral differences.



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

This standard provides guidance for the setup and use of SEM/EDS in the forensic analysis of multi-layered polymeric materials. SEM-EDS data can be useful in layer elucidation, texture elucidation, element identification, and relative element abundance determination. Such analyses are often conducted in an attempt to associate or dissociate two or more items of evidence in a forensic investigation.

The guide covers sample preparation, including a selection of sample preparation approaches. Recommendations for instrumental operating conditions are provided in this guide. Each variable and its impact on the method are presented.

Elemental peak detection criteria and considerations for element assignments are discussed. Interpretation of the elemental data to present possible compound identifications is also addressed in the guide.

While SEM/EDS can be used to dissociate two or more samples, this technique is part of a larger analytical scheme (for example, [ANSI/ASTM E1610-18](#) and [ANSI/ASTM E3260-21](#)) for the forensic analysis of polymeric materials. As such, this technique is not used in a forensic context independent of data obtained from alternative analytical techniques.