FACTSHEET FOR ANSI/ASTM STANDARD GUIDE E3294-23

Forensic Analysis of Geological Materials by Powder X-Ray Diffraction

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 guide recommends specific techniques and procedures for X-ray diffraction (XRD) analysis of geological materials in forensic casework, including XRD analysis of minimally modified materials, small quantities of material (a common limitation in forensic casework), and in situ XRD of material adhering to a substrate.

The use of XRD provides a method of mineral or phase identification as well as sample comparison for forensic science practitioners.

This guide is intended to be used with other methods of analysis (for example, polarized light microscopy, scanning electron microscopy, palynology) within a more comprehensive analytical scheme for the forensic analysis or comparison of geological materials.

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

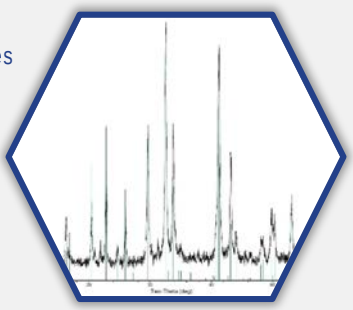
Soil or building materials from a scene may be inadvertently transferred to an item. This transferred geological material can be examined and compared to materials collected from known locations to support a forensic investigation to identify the material, identify possible geographic locations, and evaluate potential sources of the geological material.

This standard recommends quality assurance practices that support reliable and reproducible acquisition of powder XRD data.

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

This guide covers techniques and procedures for using powder XRD to analyze geological materials (e.g., soils, rocks, sediments, and materials derived from them such as concrete). XRD provides non-consumptive identification of solid, crystalline materials and can be used with single components or multi-component mixtures. XRD patterns can also be acquired from materials adhering to a substrate.

Information and recommendations for sample preparation are provided (e.g., sub-sampling of particle assemblages, sample treatments, reduction of particle size, and dispersion of minerals). XRD is particularly useful for identifying crystalline particles that are too small to examine with optical microscopy (e.g., clay minerals).



This standard covers mineral identification for instances when only provisional identifications are made. It also describes an approach for comparing samples based on their XRD patterns to screen for and document exclusionary differences between them.

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