

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?

Soil or building materials may be inadvertently transferred at a scene 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.

Use of X-ray diffraction (XRD) provides a method of mineral or phase identification as well as sample comparison for forensic science practitioners.

This guide makes recommendations for the preparation of samples and interpretation of XRD data in the context of a forensic comparison.

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

Adherence to this standard provides a consistent approach to the forensic analysis of geological materials by powder X-ray diffraction.

This standard recommends quality assurance procedures for the reliable and reproducible acquisition of powder XRD data.

Criteria for mineral identification by XRD within this standard provide a consistent reporting threshold within forensic examinations.

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

This guide provides techniques and procedures for using powder X-ray diffraction (XRD) to analyze geological materials (e.g., soils, rocks, sediments, and materials derived from them - 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.

This standard contains recommendations and considerations for sample preparations suitable for materials of limited quantity such as those often encountered in forensic casework. XRD is particularly useful for identifying crystalline particles that are too small to examine with optical microscopy (e.g., clay minerals).

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

