

Forensic Analysis of Fibers by Infrared Spectroscopy



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 provides recommendations and information about infrared (IR) spectrometers and accessories, with an emphasis on sampling techniques specific to fiber examinations.

This guide covers the collection and comparison of IR absorption spectra obtained from fibers and can be applied to a wide range of IR spectrometers and accessory configurations.

The classification of manufactured textile fiber types (apart from inorganic fibers), is the focus on this guide.

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

This guide is designed to assist an examiner in the selection of appropriate sample preparation methods for the analysis, comparison, and identification of fibers using IR spectroscopy.

Guidance is given for examiners with a basic knowledge of the theory and practice of IR spectroscopy, as well as experience in the handling and forensic examination of fibers.

IR spectroscopy can be used to obtain spectra for elucidation of the chemical composition of fibers and for comparison of two or more fiber samples.



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

Infrared (IR) spectroscopy is a valuable method of fiber polymer identification and comparison in forensic examinations. The use of IR microscopes, coupled with Fourier transform infrared (FTIR) spectrometers, has simplified the analysis of single fibers and is readily available to most forensic science service providers (FSSPs). The particular method(s) employed will depend upon the equipment available, forensic science practitioner expertise, sample suitability, and sample size.

IR spectroscopy is one technique used in a broader analytical scheme for fiber analysis. Because this technique is minimally destructive, IR analysis will follow visible and fluorescence comparison microscopy, polarized light microscopy, and ultraviolet (UV)/visible spectroscopy and will be conducted before any semi-destructive or destructive tests.

This guide covers the topics of sample handling, analysis, classification, comparison, interpretation, and documentation when performing IR spectroscopy of fibers.

IR spectroscopy can provide molecular information regarding major organic and inorganic components. Components in lesser amounts are typically the most difficult to identify. When compared to reference materials, this data can be used to characterize the fiber type. When used for spectral comparisons, the objective is to determine whether any meaningful differences exist between samples.