FACTSHEET FOR STANDARD GUIDE ANSI/ASTM E2227-23e1

Forensic Examination of Dyes in Textile Fibers by Thin-Layer Chromatography

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 provides an overview of Thin-Layer Chromatography (TLC) for fiber colorants (or individual dye components) present in dyed fibers and is intended to be applied within the scope of a broader analytical scheme for the forensic analysis of textile fibers.

The guide addresses the extraction of dyes from single fibers and from bulk material, classification of the dye or colorant, application and development of the extractants on TLC plates using an optimal elution system, and evaluation and interpretation of the resulting chromatograms. It also addresses when TLC analysis should be used, the utility of extraction procedures carried out prior to TLC analysis, and when TLC analysis may be prohibitively difficult or undesirable.

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

TLC is an inexpensive and simple technique that can complement other analytical techniques within a general analytical scheme related to forensic fiber examinations. The standard, therefore, aims to assist individuals and forensic science service providers (FSSPs) that conduct forensic fiber examinations and comparisons with an effective application of TLC.

TLC provides qualitative information about dye components, can differentiate similar colors composed of different dye components, and may help to discriminate between fibers or support the possibility of fibers sharing a common source.

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

TLC analysis should be used when the sample size is adequate and not on samples such as short lengths of fibers or pale-colored fibers lacking adequate amounts of colorant necessary to be examined by TLC. Additionally, some fiber types do not truly extract but rather change or lose color. In this scenario, the use of TLC may be precluded as it could be destructive or cause a deleterious change.

The guide covers the following key elements: sample handling, analysis, interpretation, and documentation.

- Sample handling - Advocates characterizing the dye from the known material and evaluating the eluent system to achieve optimal separation of the extract.
- Analysis - Discusses extracting the known and questioned fibers under the same conditions.
  - The type of development chambers and the parameters to be used when selecting an optimal eluent are also provided.
- Interpretation - Comparisons are conducted between chromatograms on the same plate. Interpretations are based on the observation of differences, or lack thereof, between the sets of TLC data.
- Documentation - The source of the samples, method of dye classification, details of extractants/eluent systems tested or used, and the results are required.

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