

Microspectrophotometry in Forensic Paint Analysis



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?

Color is the most eye-catching property of paints, and therefore, its consideration is critical in a forensic paint comparison.

Microspectrophotometry (MSP) is an instrumental analysis technique that enables objective measurements of the color properties of microscopic paint samples. Color is highly variable between coated objects of different sources, and MSP offers high discriminating capabilities.

This guide is intended to assist forensic paint examiners who conduct analyses of small-size paint samples using MSP in the visible (Vis-MSP) or the ultraviolet-visible (UV-Vis MSP) spectral regions.

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

Depending on the conditions of the samples, the MSP can be used in different modes (absorbance, transmittance, reflectance, or emission via fluorescence).

This guide reviews the various procedures and analytical conditions to determine the most suitable settings to attain the highest quality of spectral data acquisition. The guide also addresses ways to mitigate drawbacks related to the difficulties inherent to spectral comparisons.



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

This guide assists the forensic paint examiner with the selection of appropriate sample preparation methods and instrumental parameters for the analysis and comparison of paint samples. When used for comparison purposes, the goal of the analysis is to determine whether any exclusionary differences exist between the compared sets of spectra or if the use of additional methods within an appropriate analytical scheme is necessary.

The following key elements are discussed: the features of both reflectance and transmittance measurements for comparison purposes; the use of the spectral ranges in the short UV region (~190 to 380 nm), the visible region (~380-780 nm), and the near-infrared (~780 to 1100 nm); proper instrument performance checks prior to analysis of casework samples; the parameters for both the microscope and the spectrometer that the user needs to consider for conducting reliable analyses; the criteria for spectral comparisons and evaluations; and proper documentation practices (i.e., case notes, descriptions of analyzed items, use of chemometrics).

This guide does not address other areas of color evaluation, such as colorimetric values, paint surface texture, or pigment particle size, shape, or dispersion within a paint film.

MSP is part of an established analytical scheme for the examination of paint described in [ANSI/ASTM E1610-18](#). The overall analytical scheme is designed to detect as many chemical components as possible and maximize the discriminating potential in the context of comparative examinations.