



Standard Guide for Using Infrared Spectroscopy in Forensic Paint Examinations¹

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INTRODUCTION

Infrared (IR) spectroscopy is commonly used by forensic laboratories for the analysis of paints and coatings received in the form of small chips, residues, particles, or smears, and serves as a staple comparative technique in the assessment of whether or not questioned paint could have come from a particular source. IR spectroscopy provides molecular structure information on many of the organic and inorganic constituents contained within a single paint layer. This information can be used to classify both binders and pigments in coating materials. The classification information may then be utilized to identify probable types of paint such as architectural, automotive, or maintenance. Additionally, the use of automotive paint databases may allow the determination of information such as potential vehicle year, make and model. Databases may also aid in the interpretation of the significance (for example, how limited is the group of potential donor sources) of a questioned paint.

1. Scope

1.1 This guide applies to the forensic IR analysis of paints and coatings and is intended to supplement information presented in the Forensic Paint Analysis and Comparison Guidelines (1)² written by Scientific Working Group on Materials Analysis (SWGMA). This guideline is limited to the discussion of Fourier Transform Infrared (FTIR) instruments and provides information on FTIR instrument setup, performance assessment, sample preparation, analysis and data interpretation. It is intended to provide an understanding of the requirements, benefits, limitations and proper use of IR accessories and sampling methods available for use by forensic paint examiners. The following accessory techniques will be discussed: FTIR microspectroscopy (transmission and reflectance), diamond cell and attenuated total reflectance. The particular methods employed by each examiner or laboratory, or both, are dependent upon available equipment, examiner training, specimen size or suitability, and purpose of examination. This guideline does not cover the theoretical aspects of many of the topics presented. These can be found in texts such as *An Infrared Spectroscopy Atlas for the Coatings Industry*

(Federation of Societies for Coatings, 1991) (2) and *Fourier Transform Infrared Spectrometry* (Griffiths and de Haseth, 1986) (3).

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:³

- D16 Terminology for Paint, Related Coatings, Materials, and Applications
- E131 Terminology Relating to Molecular Spectroscopy
- E1421 Practice for Describing and Measuring Performance of Fourier Transform Mid-Infrared (FT-MIR) Spectrometers: Level Zero and Level One Tests
- E1492 Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory

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² The boldface numbers in parentheses refer to the list of references at the end of this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.