



### A128 Discrimination of Architectural Paints: Single White Layers

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The goal of this presentation is to disseminate information to attendees about a recent study conducted by the FBI Lab in the discrimination capability achieved for single, white paint layers.

This presentation will impact the forensic science community by describing the steps taken to discriminate unrelated single, white paint layers in order to assess how successful this process was using light microscopy, FTIR, SEM/EDS, and py-GC/MS.

This presentation reports on a recent FBI Laboratory project designed to assess the discriminating power of physical and chemical comparisons of single-layer, white architectural paints.

In contrast to automotive finishes, assessing the significance of consistent findings between architectural paint samples can be problematic given their ubiquity. Moreover, composition cannot be used as an indicator of the manufacturer, in that different brands can be indistinguishable. Few studies have been conducted to assess the significance of architectural paint comparisons, particularly of single-layer, white paints. Thus, this study has been undertaken in an attempt to evaluate the extent to which randomly collected samples of single-layer, white architectural finishes can be discriminated as well as the probative value of conducting this type of examination. The methodology for this study utilized the FBI Laboratory's standard operating protocols for paint analysis.

Approximately 250 white architectural paint layers were selected as a subset of a larger study that involved 960 architectural paint samples. The original sample set was collected and submitted by FBI Laboratory and FBI field office personnel, as well as forensic scientists from a variety of law enforcement agencies within North America. Collection sites included interior and exterior surfaces such as walls, doors, and trim areas of private homes or commercial buildings. Therefore, the total sample set was considered representative of architectural paint systems that would be submitted as evidence to a forensic laboratory for analysis.

In order to concentrate this follow-up study on the discrimination capability of the FBI Laboratory's current paint protocols on single-layers

of white paint, the sample set was accumulated as follows. Any specimen with a surface layer characterized as "white" formed the basis of the sample set. In addition to these 197 samples, 56 samples with an off-white surface layer were considered to be viable candidates. This approach yielded a sample set of 253 "single, white-layer" samples, in that, the only evaluations being made involved intercomparisons of the physical characteristics and chemical formulations of the topmost layer.

In keeping with the format established in the FBI Laboratory's previous architectural paint study, the samples were first evaluated by Fourier Transform Infrared Spectroscopy (FTIR). From these analyses, samples were placed into one of four categories based on the filler pigments present. As the primary pigment used in architectural paint formulations, titanium dioxide was not considered to be a discriminating factor for classifying these groupings. Therefore, the four categories were: calcium carbonate; kaolin; both calcium carbonate and kaolin; and, neither calcium carbonate nor kaolin. Spectra of samples within each category were then subjected to pairwise comparisons.

Subsequently, any undifferentiated pairs or groups of samples were then macroscopically and microscopically compared side-by-side under the same lighting conditions to document physical characteristics, such as surface finish (glossy, matte, or eggshell) and "color." Chemical analysis of any remaining undiscriminated samples involved the use of scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM/EDS) and pyrolysis gas chromatography with mass spectral detection (Py-GC/MS).

The objective of this project was to evaluate the probative value of conducting comparisons of single-layer, white architectural paints, as well as to determine the ability of the FBI Laboratory's overall analytical scheme to distinguish between these types of samples. The results of this study will be the subject of the presentation.

#### **Architectural Paint, White Paint, Single-Layers**