



### B46 Elemental Profiling of Paint Samples by ICP-MS and LA-ICP-MS

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After attending this presentation, attendees will have an understanding of the principles and techniques used in the elemental analysis and comparison of paints and their application in discrimination studies for the forensic analysis of paint evidence. The benefits of quantitative analysis of trace elements in the differentiation between similar paint samples will also be presented. Those attending this presentation will be informed as to the use of Laser Ablation versus solution based sample introduction for Inductively Coupled Plasma Mass Spectrometry analysis of paint systems.

This presentation will impact the forensic community and/or humanity by demonstrating the ability to quantitatively analyze trace elements from a complex and highly variable matrix. Also, this research will aid in strengthening the evidential value of trace evidence paint transfer commonly associated with automotive "hit and run" as well as a variety of other potential crime scenarios.

The quantitative elemental profile of a material has been demonstrated to provide for an excellent means to discriminate between otherwise similar paint samples (same organic composition). The research presented in this poster applies the principles and techniques utilized for the quantitative elemental analysis of materials such as glass towards the elemental profiling of the more complex and compositionally varied matrix materials of latex and automotive paint systems.

The analytical procedure included a solution based microwave digestion using concentrated Nitric acid. The same samples were also analyzed by a standardless method recently developed for glass, which utilizes Laser Ablation. This method eliminates the need for matrix-matched standards to obtain quantitative analysis. This is a great benefit to the analysis of paint samples due to the complexity and diversity of paint matrices.

An element menu (along with detection limits for target elements in latex paints) was determined and will be presented. A method to standardize the analysis of paint samples using a standard addition of target metals to the latex paint system enables the quantitative determination of a menu later used for discrimination between paint samples. The utility of the discrimination between paints using this method is presented. Approximately 15 white latex paints from varying manufacturers were analyzed.

The compositional heterogeneity within a single can of paint was examined and the results are presented. The heterogeneity was determined from the analysis of 10 separate samples from the same can of paint. This information was obtained for standard white latex paint as well as several popular colors of latex paints. Separate element menus were developed for each color.

Each sample was analyzed by a solution method of sample introduction as well as Laser Ablation. The benefits, as well as the disadvantages, of both techniques were evaluated. A standardless method of analysis was utilized for the quantitative analysis of paint, sampled by Laser Ablation, which eliminated the need for a matrix-matched standard. The reproducibility, accuracy and ease of use for each technique are presented.

These techniques were also applied to the analysis of multiple layer samples of latex paints as well as automotive paint systems. The complexity of conducting elemental analysis on multiple layers with minimal sample contamination between the layers is addressed with a novel approach to sampling each layer using LA-ICP-MS.

This research is very pertinent to the forensic community through its demonstration of the ability to quantitatively analyze trace elements from a complex and highly variable matrix. Also, this research will aid in strengthening the evidential value of trace evidence paint transfer commonly associated with automotive "hit and run" as well as a variety of other potential crime scenarios.

**Paint, ICP-MS, Laser Ablation**