D34 Analysis of Cyanoacrylate Fumigation's Effects on the FTIR Classification and Comparison of Polymers

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After attending this presentation, attendees will understand the effects fumed cyanoacrylate has on polymer samples and how that impacts the infrared spectral data used for comparisons and classifications.

This presentation will impact the forensic science community by explaining that cyanoacrylate is a polymer and can potentially react with other polymers such as paint chips or synthetic fibers found in trace evidence via crosslinking or electrostatic attraction. The micro-Fourier Transform Infrared (FTIR) spectral data found affects the process of determining classifications and comparisons of trace evidence.

Cyanoacrylate fumigation is a common method used in forensic science to develop and preserve latent fingerprints on evidence either in the field or at the laboratory. Three items are necessary to perform this method: a viable substrate of cyanoacrylate such as commercially purchased superglue; a heat source to vaporize the cyanoacrylate substrate; and an enclosed system to provide an environment with the proper humidity. This process is commonly used in the forensic science field because these materials are affordable and can be easily used at crime scenes. Cyanoacrylate fumigation reacts with the amino acids found in sebaceous secretions of the fingerprint and is one of the first methods performed on evidence because of its ability to both develop and preserve latent prints.

The samples analyzed in this research study were prepared uniformly to closely mimic trace forensic laboratory evidence. This procedure minimizes the effect sample size may have on the fuming process and FTIR spectral analysis. Eighteen random paint samples were chosen and shaped under a stereoscope using a scalpel. The samples in this study were weighed, and an average mass was determined to allow sampled polymers from different sources to be uniformly prepared.

A comparison study between fumed and non-fumed polymer samples was performed to evaluate the effect cyanoacrylate fumigation has on the FTIR spectral data and analysis. Polymer samples were collected from six different sources: tool paint; spray paint; architectural paint; automobile paint; glitter; and synthetic fibers. A triplicate of each sample was placed on a separate microscope slide and fumed with ASI® Adhesive Systems RP100 commercial superglue for the same duration of time. Non-fumed controls for each polymer along with a control sample of isolated fumed cyanoacrylate were collected. All samples were analyzed using a Thermo Nicolet® Continuum FTIR microscope instrument. The fumed polymer data was compared to the non-fumed control data, and conclusions were determined based upon the addition or absence of cyanoacrylate peaks.

Future research can be done in developing a non-destructive clean-up method to remove the cyanoacrylate from trace polymer samples. This would allow latent fingerprints to be developed and preserved first without impacting the following analysis of trace evidence. Another study could determine the penetration ability of cyanoacrylate on multi-layer paint, i.e., automobile paint. A clarification on whether cyanoacrylate infrared peaks can be seen in more than just the top layer spectra is needed.

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Cyanoacrylate Fumigation, FTIR, Polymer Classification

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