A71 The Use of Direct Analysis Mass Spectrometery for Ink Analysis

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The goal of this presentation is to determine if the direct analysis mass spectrometery is sufficient to analyze various types of inks.

This presentation will impact the forensic community by teaching about new applications of the direct analysis mass spectrometery of inks.

The most widely encountered material found on documents submitted for forensic examination is ink. All inks, in their basic form, are mainly composed of a colorant(s) that is suspended in a vehicle (solvents and resins). There are also other ingredients that may be present in inks, which can include antioxidants, preservatives, and trace elements, but these typically form a small fraction of the overall formulation. Nevertheless, their importance should not be discounted because it is possible that the combination of these components allow otherwise similar inks to be discriminated. There are different types of inks that may be encountered on documents such as writing inks, printing inks from conventional commercial printers, and office machine inks. The results from an ink examination can be extremely beneficial by helping link multiple documents, ascertain whether they have been altered, and determine when they were produced.

The mass spectrometer used is capable of performing direct analysis in real time and allows spectra to be obtained by placing a sample in the path of the ion source. The methodology can be virtually non-destructive and involves very little sample preparation. Although introduced in 2005, numerous applications have been documented in the recent literature with promising results for the analyses of various materials. In particular, research has been published in the area of ballpoint writing ink analysis. This study will evaluate sample preparation and focus on optimizing parameters for various types of inks including ballpoint, non-ballpoint, and inkjet inks. Individual components and the entire formulation of the inks will be analyzed using the non-destructive method as well as liquid extractions. Spectra obtained from neat samples will be searched against a library composed of spectra from the individual components to determine the feasibility of identifying characteristic ions that make certain inks unique. Finally, inkjet ink documents, which can be composed of multiple colors (e.g., cyan, magenta, yellow, black, light cyan, light magenta) will be analyzed to determine if the mixture of inks can be compared with combined individual spectra in an attempt to identify a particular manufacturer.

The results from this study will lead to a greater understanding of the analysis of inkjet and writing inks. The analytical data obtained from this technology may potentially have a significant impact on the conclusions reached in cases that involve the comparison and identification of inks.

Direct Analysis in Real Time, Inks, Mass Spectrometry

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