



Questioned Documents Section – 2009

J17 The Classification of Inkjet Inks Using AccuTOF^ä DART^ä (Direct Analysis in Real Time) Mass Spectrometry

Gerald M. LaPorte, MSFS, United States Secret Service, Forensic Services Division, 950 H Street, Northwest, Washington, DC 20223; Justin L. Wilson, West Virginia University, 717 Snider Street, Morgantown, WV 26505; Stephanie M. Houlgrave, BA, The George Washington University, 4001 North Ninth Street, #519, Arlington, VA 22203; and Joseph C. Stephens, MSFS, United States Secret Service, 950 H Street Northwest, Forensic Services Division, Washington, DC 20223*

The goal of this presentation is to propose a new methodology for the identification of inkjet inks.

This presentation will impact the forensic science community by presenting a more recent instrumental analysis technique that can be used for the analysis of inkjet inks.

Identifying the make and model of an inkjet printer based on the examination of a questioned document can be invaluable information. However, there are numerous models of printers that can utilize the same ink, but this should not deter the forensic document examiner from narrowing the scope of possible printers. In addition, further physical examinations may help narrow the population of candidates even more. With the advent of inkjet technology, there has been a technological evolution of inkjet printers with respect to quality and speed, resulting in necessary changes to the chemistry of the ink. Indeed, this has created a time line of introductory dates for new formulations. Of course, this information can be used to ultimately determine if a document was produced on its purported dates by comparing with known standards.

AccuTOF[™] DART[™] is a mass spectrometer that allows spectra to be obtained by placing a sample directly in the path of the ion source. The methodology can be virtually non-destructive and involves very little sample preparation. Its use has been well documented in the recent literature with promising results for the analyses of various materials. More specifically, analyses on ballpoint inks using DART[™] has been published, and research is indicating that this technique has excellent potential for the identification of certain inks.

The objective of this study is to determine if the DART[™] can be used to reliably differentiate and identify inkjet inks. The images and/or text produced from an office machine system that utilizes inkjet technology can be produced using multiple colors (e.g., cyan, magenta, yellow, black, light cyan, light magenta). This can pose a problem for non-destructive procedures that attempt to characterize inkjet inks without chemically separating and comparing the components. The methodology designed in this study relies on the creation of single spectra profiles of individual colors, subsequently combining the spectra, and then adding the newly combined data into a searchable library.

The spectral data for various inkjet inks from major manufacturers were obtained, evaluated, and entered into an electronic and searchable database. Afterwards, an analysis of printed documents from known office machines were conducted using the DART[™] and classified by manufacturer and inkjet cartridge number. Finally, a blind study was conducted to determine the validity and accuracy of the methodology for discriminating and identifying inkjet inks found on questioned documents.

DART, Inkjet, Ink