



Breakfast Seminars - 2017

BS2 Analysis of Black-and-White Documents — Seeing Beyond the Monochrome

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After attending this presentation, attendees will understand the basic scientific methodology used in the forensic examination of black-and-white documents. Attendees will have an opportunity to learn how physical, optical, and chemical analyses are utilized in the examination of inks, toners, and papers.

This presentation will impact the forensic science community by demonstrating the importance of using the best analytical practices in the scientific analysis of questioned documents. This presentation will discuss the application of Thin-Layer Chromatography (TLC), Attenuated Total Reflectance/Fourier Transform Infrared (ATR/FTIR) spectroscopy, and X-Ray Fluorescence (XRF) spectroscopy in the analysis of inks, toners, and papers. This presentation will also showcase how the evolution of forensic document examination techniques has improved sample discrimination through the expanded use of analytical chemistry and statistical analysis.

Forensic examination of documents commonly includes microscopic analysis utilizing white light and other energy sources such as Ultraviolet (UV) and Infrared (IR). Although this level of examination may be sufficient for the analysis of color inks and papers, in many instances it does not provide enough discriminating power to differentiate components of black-and-white documents. For example, black toners often appear similar microscopically with the possible difference of fusing patterns. Black inks may, to an extent, be distinguished based on their physical and optical characteristics and white papers may contain IR luminescent fibers or UV brighteners, allowing for a certain degree of discrimination. While optical examinations provide a wealth of information, it is prudent to recognize their limitations, such as false positive results from document contamination or alteration.

The best practice is to continue with chemical analyses upon completion of the physical and optical examinations. Optimally, a suite of analytical techniques should be used to evaluate various aspects of the sample, including colorants, resins, and elemental composition. For example, TLC is a well-established technique for the analysis of soluble colorants in inks and brighteners in papers. It is also successfully used to evaluate resins and waxes found in toner particles. FTIR spectroscopy is employed to characterize toner polymers and paper coatings. XRF spectroscopy is used to examine elemental composition of analytes and may allow discrimination of papers and toners based on concentrations of iron, silicon, sulfur, titanium, or other elements.

This presentation will demonstrate that chemical examination of black-and-white documents provides a significant amount of information that may be crucial in discriminating samples. As forensic examination of documents has progressed significantly over the past century and moved from penmanship teachers conducting physical examinations using a loupe to highly trained chemists performing analyses using sophisticated instrumentation, it is important to employ the current best practices, which include a full spectrum of techniques.

Ink Analysis, Toner Analysis, Paper Analysis