J23 Analysis of Inkjet-Printed Documents I: Physical and Chemical Challenges

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After attending this presentation, attendees will have a better under- standing of the kinds of materials used in inkjet printer inks, and the unique challenges of the analysis of color formed by discontinuous combinations of a limited number of dyes or pigments.

With a good scanner and color printer, fraudulent currency, postage stamps, collectibles, and identification can now be easily generated. It is important to understand the variables involved that could possibly connect a questioned document to a certain type of inkjet printer. These observations will impact the forensic community by being useful when fraudulent printed documents are under study.

This presentation will provide insights into the power of currently available inkjet printers that can be used for generating fraudulent documents and the variety of physical and chemical parameters associated with the printed output that examiners might encounter.

In analyzing a questioned document, many aspects can be defined using simple microscopy. Is the item printed using a press, an intaglio method, or is it the output of a copy machine? Is it the product of an inkjet or laser printer? Such information may allow for authenticity to be established, or may be an important link back to a specific device used for the document's creation. The focus of this presentation is on inkjet printers. Modern inkjet printers most often use a four-ink color system (cyan, magenta, yellow, black). Increased complexity results as new systems become available that use a larger number of inks, and have the capability of printing on not only traditional paper but photo-quality paper as well. In most cases, it is easy to determine that a document has been printed with an inkjet printer, since modest magnification reveals individual ink spots, however developments continue. Some printers are capable of printing clusters of spots in addition to single, isolated spots. Printers with variable resolution may lead to overlaps of spots, making the output difficult to interpret. In addition to replaceable reservoirs of ink, some inkjet printers are also using gloss optimizer, a "clear coat" that can stabilize printing on glossy paper.

Some observations that we have made, that may be important in char- acterization of inkjet-printed documents, include the order in which colors are applied. A second interesting feature is the appearance of small amounts of unexpected colors - due to printers that actively keep jets clear by using them during printing, even for colors not needed.

The primary interest in our laboratory is the analysis of colorants, and the forensic applications of this capability. Inkjet printer inks are rapidly changing from being dye based to pigment based. "Archival quality" prints using pigments are reported to be capable of lasting more than 100 years without fading - a very different situation from dye-based inks, which can fade over a period of months. In order to chemically analyze components of a document printed using an inkjet printer, information on the distribution of color on the substrate is very useful to have and understand.

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Questioned Documents, Inkjet, Pigments

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