



B74 The Effect of Electron Beam Irradiation on Writing Inks

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After attending this presentation, attendees will learn that the irradiation of mail by the U.S. Postal Service does not appear to alter the dye/pigment content of writing inks on questioned documents.

This presentation will impact the forensic community and/or humanity reassuring forensic document analysts that the electron beam irradiation process currently being used by the U.S. Postal Service does not appear to induce changes of writing inks.

After attending this presentation, attendees will understand the procedure for performing ink analyses, the electron beam irradiation process, and the effects of this form of irradiation on inks and paper. After the October 2001 anthrax letter attacks, the U.S. Postal Service began to irradiate mail destined for certain postal codes. Because of the high dosages of radiation involved in this type of processing, reports quickly began to surface of damage to the contents of irradiated envelopes and packages.

Several recent studies by the Smithsonian Institution's Center for Materials Research and Education reported that the irradiation process did have an effect on writing inks. Since the U.S. Secret Service routinely performs chemical analyses of writing ink samples on questioned documents, a decision was made to investigate what effects the irradiation process would have on such examinations. The study involved selecting 97 different black, blue, red, green, and yellow writing inks. A mixture of ink types was selected, including ballpoint, felt-tip, plastic-tip, gel, and rollerball. Thirty-five additional samples (taken from the group of 97 inks) that had been deposited on Whatman filter paper at various times within the past 26 years were also chosen to study the impact of the irradiation process on aged ink samples.

The effects of the irradiation process on inks were evaluated using thin layer chromatography (TLC) and well as optical spectroscopy. Two different solvent systems were used for the TLC analyses. Two different paper types were used in this study, including plain photocopy and blue lined notepad paper. For operational security reasons, the exact radiation dosage and conditions are not provided. Optical spectroscopy (absorbance curves) was performed using a Foster & Freeman Video Spectral Comparator 2000 high resolution. Optical properties of the inks were evaluated before and after irradiation processing, including infrared reflectance and infrared luminescence. Any changes in the ultraviolet fluorescence of the paper were also recorded.

The authors will present the overall results from this study, which indicate that (unlike recent previous studies performed by the Smithsonian Institution) the irradiation process did not appear to cause any significant detectable changes in any of the ink samples. This may be due to changes in the radiation dosage levels used by the U.S. Postal Service since October 2001. Neither the chemical (TLC) nor the optical analyses showed any unexplainable differences. Also, neither the age of the sample (up to 26 years old) nor the choice of solvent system caused any detectable changes in the samples. However, there was a significant decrease in the intensity of the ultraviolet fluorescence of the plain photocopy paper samples.

Ink Analysis, Irradiation, Thin Layer Chromatography