B90 New Approach for the Analysis of Duct Tape Backings

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After attending this presentation, attendees will be aware of the various multi-layered duct tape backings that can be encountered and how the FBI's standard operating procedure for duct tape analysis has been modified to account for these multi-layered backings.

This presentation will impact the forensic community and/or humanity by providing information that affects the forensic analysis of duct tapes.

Duct tapes are often submitted to crime laboratories as evidence associated with abductions and homicides. Within the FBI Laboratory,

duct tape is analyzed for comparative examinations or for sourcing purposes. The objective of the tape comparison examination is to determine the possibility of an evidentiary link between a suspect and a crime or between different crime scenes. When there is no source available for comparison, a duct tape specimen can be examined to determine class characteristics that may provide manufacturer information.

A logical first step for either comparative examinations or sourcing requests is to conduct visual and microscopic examinations on the submitted samples in order to evaluate physical characteristics such as backing color, adhesive color, width, yarn count per square inch, and weave pattern. If the samples are consistent following visual and microscopic examinations, chemical composition analysis is performed on the three main components of each tape: backing, adhesive, and reinforcement fabric.

Prior to this study, duct tape backings at the FBI Laboratory were inspected visually and microscopically for color and fabrication markings, measured for width and thickness, and analyzed by scanning electron microscopy / energy dispersive X-Ray spectroscopy (SEM/EDS) for elemental content and by X-Ray diffraction for crystalline compound information. No additional examinations were typically performed on the backings, because the expectation was that little discrimination would be offered.

However, while conducting casework examinations on a duct tape specimen, it was determined that the backing was multi-layered. Following additional analysis and discussion with industry contacts, the use of multi-layered backings was found to be a common tape- manufacturing practice. Therefore, the FBI Laboratory initiated a study to determine how frequently multi-layered backings might be encountered, what types exist, and how they should be properly examined.

This study involved the analysis of eighty-two duct tape samples that have been acquired by the FBI since 1993. Most of the tapes were purchased at discount stores or home-improvement retailers, are marketed as general purpose or economy grade, and cover a variety of
U.S. and foreign manufacturers. Therefore, the group represents tapes that could be easily obtained by consumers and would be comparable to casework evidence submitted to the FBI Laboratory.

A variety of different backing layer structures was observed through the use of visual and microscopic examinations as well as Fourier transform infrared spectroscopy with an attenuated total reflectance attachment.

As a result of this study, the FBI Laboratory's standard operating procedure for tape analysis has been modified. Microscopic examinations are now performed on duct tape backing cross-sections to identify any possible layers. Furthermore, the protocol has been modified to include FTIR-ATR analysis of both sides of the backings. Following these analyses, the results obtained may lead to discrimination between two samples that may not have been differentiated otherwise. Even when no differences are found following these examinations, the layer structure may influence the sample preparation for subsequent analyses (e.g., SEM/EDS).

Duct Tape, Microscopy, Attenuated Total Reflectance (ATR)

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