B129 Use of a Database for Significance Assessment and Sourcing of Duct Tapes

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After attending this presentation, attendees will learn about the com- pilation and use of a duct tape database, which allowed for the assessment of the significance of the results of duct tape comparisons and the evalu- ation of the database's utility for sourcing.

This presentation will impact the forensic community and/or humanity by informing the forensic community about the significance of the results of a duct tape comparison and to determine the utility of a database for sourcing purposes.

Duct tape examinations have been conducted in crime laboratories for decades; however, few publications exist to support the discrimination ability of such examinations. As a result, the Chemistry Unit of the FBI Laboratory embarked on this study to assess the significance of the results of a comprehensive duct tape comparison and to evaluate a database's utility for duct tape sourcing.

Duct tapes are often submitted to crime laboratories in association with abductions and murders. The objective of the analysis is to establish a possible evidentiary link between a suspect and a crime or crimes. A logical first step is to conduct visual and microscopic examinations on the submitted samples in order to evaluate and compare physical character- istics such as color, width, thickness, scrim count, and fabric weave.

If the samples are consistent following visual and microscopic exam- inations, chemical composition analysis is performed on each of the tapes' components. According to the FBI protocol, the first step is the analysis of the duct tape adhesives by Fourier transform infrared spectroscopy (FTIR) with a microscope attachment. For samples that remain consistent fol- lowing FTIR examination, scanning electron microscopy / energy dis- persive spectroscopy (SEM/EDS) is then performed on both the adhesives and backings. X-ray diffractometry (XRD) is also performed on the intact specimens and occasionally on the duct tape backing alone.

The study involved the analysis and comparison of over eighty duct tape samples acquired since 1993. Most of the tapes were purchased at common retail stores, are marketed as general-purpose or economy grade, and cover a variety of manufacturers. Therefore, the collection represents tapes that could be easily obtained through retail channels.

In order to evaluate the analytical scheme's overall ability to discrim- inate the samples, an individual sample's analytical results were evaluated in a stepwise fashion through the examination protocol until it was dis- criminated from all others. The number of samples found to be indistinguishable following all examinations then provided the overall discrimi- nation ability of duct tape analysis.

Each of the physical and chemical examinations was performed on all of the samples in this collection in order to compile a database for sourcing of duct tapes in casework. All the physical information was subsequently stored in Spectral Library Identification and Classification Explorer (SLICE), a platform for archiving EDS and X-ray fluorescence spectra with data entry capabilities for relevant physical and chemical information. The relational search capabilities of the physical data and EDS spectra aided in the evaluation of evidentiary significance for this project. FTIR and XRD data were stored in a separate format, though the general infor- mation obtained from those examinations was still included in text format in SLICE.

In order to validate SLICE for use in casework, several of the database samples were chosen at random. An analyst was then given the samples and instructed to treat the samples as casework samples from a sourcing case to determine if she could determine the products' manufacturers.

The results of this study will be presented in detail. Discussion will include the ability of the analytical scheme to discriminate the samples. Furthermore, the results of the validation study will be presented, and a casework example will highlight use of the database for sourcing.

Database, Discriminating Power, Duct Tape

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