



A191 Duct Tape Sourcing Examinations: Developing Investigative Leads Using Multiple Resources

Diana M. Wright, PhD, and Andria H. Mehlretter, MSFS, FBI, Laboratory Division, Chemistry Unit, Rm 4220, 2501 Investigation Pkwy, Quantico, VA 22135*

After attending this presentation, attendees will have knowledge of the methodology used to source duct tape bindings using a combination of factors that can provide highly discriminating investigative lead information. These factors include physical characteristics, instrumental analyses such as X-ray Diffraction (XRD) and Pyrolysis-Gas Chromatography/Mass Spectrometry (Py/GC/MS), a duct tape reference collection and database, and industry contacts. Results demonstrate that the combination of these factors can provide highly discriminating investigative lead information.

This presentation will impact the forensic science community by disseminating knowledge regarding discrimination achieved through XRD and Py/GC/MS analyses, two techniques not commonly associated with duct tape analyses. Further, the use of a reference collection and searchable database provided an efficient means of culling large-scale manufacturers and distributors from the list of possible tape brands.

The case example presented will describe how the FBI Laboratory was able to develop investigative lead information in a homicide case. When investigators arrived at the crime scene, they observed a deceased victim and a witness loosely bound with duct tape. The witness stated that both persons were victims of a robbery. Local law enforcement requested forensic examinations to further their investigation, including sourcing of the tape.

The bindings were examined in order to document physical characteristics such as the backing construction, adhesive color, width, scrim count and construction, and the backing and overall tape thicknesses. Chemical analyses of the adhesive and backing components of the duct tape were conducted via Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy/Energy Dispersive Spectroscopy (SEM/EDS), XRD, and Py-GC/MS. From the FTIR results of the adhesive, talc was readily observed, but the rubber and tackifying resin composition were difficult to interpret. XRD results revealed contaminants, tremolite and phlogopite, not previously identified in duct tape adhesives analyzed in the FBI Laboratory, suggesting the tape was not a commonly available product. Tremolite is a form of asbestos and phlogopite is a sheet aluminosilicate that falls into the mica class; both can be found as contaminants in common filler and extender pigments such as talc and dolomite. Py-GC/MS was used to elucidate that the adhesive formulation was styrene-butadiene-styrene (SBS) when FTIR results did not adequately distinguish between SBS or the use of a tackifying resin in a styrene-isoprene-styrene (SIS) formulation. The distinction was important for sourcing purposes given that most manufacturers use SIS or isoprene alone.

Using the National Forensic Tape File (NFTF) reference collection and database, industry contacts, and the Internet, a single manufacturer was able to be identified, and from it, a specific tape product was targeted as the source of the bindings. When sales data for this product was evaluated for the state where the crime occurred as well as its three neighboring states, it was found that only one distributor bought the product and in turn sold it to eight industries: mostly mid-size manufacturers of consumables (e.g., paper products), durable goods (e.g., furniture, storage tankers, food services), and two locations of a funeral service provider.

This case highlights the utility of employing a variety of analytical and reference-based resources to source manmade, mass-produced materials. It is also unusual in that the chemical analyses proved to be more discriminating than the totality of the physical characteristics of the tape due to the raw material choices of the manufacturer, both the specified choice of SBS and the filler with the readily observed impurities. Compelling investigative lead information was reported to the contributor using the described resources, most of which are readily available or can be developed by any laboratory system interested in conducting duct tape sourcing examinations.

Duct Tape Sourcing, Instrumental Analysis, Reference Collection