



B151 Discrimination of Black Electrical Tape Using Attenuated Total Reflectance and Pyrolysis-Gas Chromatography/ Mass Spectrometry

Sparkle T. Ellison, BS, and Jessica L. Michaud, University of South Carolina, 631 Sumter Street, Columbia, SC 29208; Kristen W.S. Pate, PhD, University of Virginia, Office of Sponsored Programs, PO Box 400195, Charlottesville, VA 22904; Edward G. Bartick, PhD, Suffolk University, Department of Chemistry/Biochemistry, Beacon Hill, 41 Temple Street, Boston, MA 02114-4280; and Stephen L. Morgan, PhD, University of South Carolina, 631 Sumter Street, Columbia, SC 29208*

Upon completion of this presentation, attendees will have learned about the nature of the components in electrical tape that facilitate differentiation of tapes from different manufacturers from one another.

This presentation will impact the forensic science community by presenting the development of procedures for the discrimination of black electrical tape by attenuated total reflectance (ATR) IR, and pyrolysis-gas chromatography/mass spectrometry (GC/MS). Multivariate analysis is performed to visualize differences between the spectra and pyrograms of tapes as well as to investigate possible adaptation of procedure to forensic casework samples.

The goal of this presentation is to present procedures for the discrimination of black electrical tape by attenuated total reflectance infrared spectroscopy, and pyrolysis-gas chromatography/mass spectrometry. Attendees will learn about the nature of the components in electrical tape that facilitate differentiation of tapes from different manufacturers from one another.

This presentation will report on the use of Fourier transform infrared (FT-IR) spectroscopy with attenuated total reflectance (ATR) combined with pyrolysis gas chromatography/mass spectrometry for the differentiation of black electrical tape based on the composition of the tape's backing. Principal component analysis (PCA) and canonical variate analysis (CVA), also known as linear discriminant analysis, will be applied to IR and GC/MS data sets to evaluate the discriminating power of the combined information.

The backing of electrical tape usually contains a polymer such as polyvinyl chloride (PVC), carbon black for color, inorganic additives/fillers as well as plasticizers to increase polymer flexibility.

Tape samples were collected from various stores in the United States. For ATR analysis, a sample of each tape was adhered to a glass microscope slide, allowing for quick analysis of the tape backing. Ten replicate spectra from different locations on the tape sample were obtained. Analysis of the data using principal component analysis discriminated the tape samples with a 88% classification accuracy. To further discriminate between the other samples, pyrolysis GC/MS was employed. For pyrolysis GC/MS, each tape was sampled using a microscope and a surgical blade to remove a small piece of backing from the center of the tape, taking care not to include any adhesive. The sample was affixed to the flat end of a 26 mm long quartz filler rod that acts a platform for quartz sample tubes used in the pyrolysis autosampler (CDS Analytical, Inc, Oxford, PA). Multivariate analysis was performed to visualize differences between the spectra and pyrograms of tapes and to evaluate the ability to classify unknown tape samples.

Black Electrical Tape, ATR, Py-GC/MS