

Fibers Examination by FT-Raman and UV-Vis Spectroscopy

References

- Robertson, James, Editor. *Forensic Examination of Fibres*; Ellis Horwood: Chichester, England, 1992.
- Saferstein, R. *Criminalistics: An Introduction to Forensic Science*, 6th edition, Prentice-Hall 1998; pp 221-239. {fibers }
- Skoog, D.A.; Holler, F.J.; Nieman, T.A. *Principles of Instrumental Analysis*, 5th ed.; Saunders: Philadelphia, 1998; Chapter 18. {Raman spectrophotometry }

Goal

To identify an unknown fabric by fiber type and color, and to identify similarities and differences, if possible, between fabrics associated with victim and suspects.

Suggested Methods of Analysis

FT-Raman spectrophotometry and visible, reflectance spectrophotometry

Materials

Samples: Fabric samples of the same color stored in separate, sealed, plastic bags.

Standards: White fabric (cotton and cotton/polyester) with a range of known compositions.

FT-Raman Procedure

Raman spectrophotometry is used to identify the primary type (chemical composition) of fiber and provide an estimate of the blend percentages in the fabric. Any fiber type that is blended with another is blended with cotton, but not all fabrics are necessarily blends. Follow the instructions for the Raman instrument to align the near infrared laser with the fabric sample and to generate a Raman spectrum. Collect one hundred scans with a resolution of 4 cm^{-1} to reduce the noise in the Raman spectra. Generate spectra for the samples and some of the standards.

Compare the sample and standard spectra to decide whether two of the fabrics could have the same origin. You may also wish to estimate the relative blend percentages of the sample fabrics. One way to do this is by observing the differences in the ratio of certain peaks between spectra of different blends.

Diffuse Reflectance Procedure

A diffuse reflectance (integrating sphere) accessory in the UV-Vis spectrophotometer is used to determine the exact color of a fabric sample. Follow the operating instructions for the instrument. First, set the 100% reflectance background with a reference (Teflon) disk covering the sample port of the integrating sphere. Record the visible spectrum from 350 nm to 750 nm. Next, position the fabric sample over the sample port and record its visible spectrum. Repeat for all of the samples.

Compare the wavelength characteristics of the sample spectra to decide whether two of the fabrics could have the same origin.