



Questioned Documents Section – 2006

J19 Fibreroptic Reflectance UV-Visible Spectroscopy of Paper Currency, Driver's Licenses and Other Questioned Documents

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After attending this presentation, attendees will understand how a UV-Visible absorption spectrum can be obtained using fiber optics, and how personal identification items and other question documents can be characterized with this method.

This presentation will impact the forensic community and/or humanity by showing attendees how to assemble a fiberoptic spectrometer and interpret the resulting spectra.

Reflectance spectroscopy, using infrared, visible or ultraviolet light, is conceptually a simple experiment in which absorption spectra of materials on surfaces can be obtained. In the experiments to be described, a fiberoptic probe that illuminates and collects reflected light from a small area is used. The angle between the probe and sample can be easily changed, and components of documents and related items can be quickly studied. Spectra of dyes and pigments on a surface can be obtained and compared. In some cases, the number of colorants used can be easily determined. The method is very powerful for comparison of samples. Several examples will be shown to demonstrate the utility. Recent work in the aging of ink on paper suggests that simple spectroscopic methods may be developed for providing information on the age of a signed document. In some experiments with this instrumental setup, UV spectra were collected that appeared to have considerable 'structure', much finer than would be expected for a condensed-phase sample. This was observed when inks on licenses were under study - when spectra were being taken through transparent coatings. The "beats" observed in the spectra are due to interference of the light that occurs due to the method used, and the fact that a thin film was encountered. One can take advantage of the phenomenon and estimate the size (thickness) of the film. (While film thickness can be calculated using a simple relationship, the result is consistent but not necessarily correct. This will be explained based on the mathematical relationship commonly used.)

Spectroscopy, UV-Visible, Documents