B141 Polarized Infrared Spectroscopy of Tapes as a Supplement to Physical Matching

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After attending this presentation, attendees will gain knowledge of alternative and supplemental techniques for examination of tape evidence.

This presentation will impact the forensic community and/or humanity by demonstrating how of the use of polarized microscopy techniques can be applied to the infrared region and tape evidence.

The goal of this study was to examine the value of polarized infrared (IR) microscopy as a supplement to visual examination and physical matching for tapes. Tapes generally consist of adhesive coated on a polymeric support material. The polymer has an ordered, pseudocrystalline structure amenable to analysis with polarized microscopy. Such studies are not limited to the visual range. Here, studies were conducted in the visual and infrared regions using normal and polarized light and the results were correlated with photomicrographs of the torn tape edges.

Samples were prepared by placing torn Scotch® tape, matching end to end, on a microscope slide. Images were collected under normal and crossed polars in the visual range. Using instrumental software, a grid was established on the polymer side of the torn tape on both of the separated pieces at various distances from the tear edge. Infrared spectra were obtained at each spot for a total of ten per grid. The mapping was repeated under crossed infrared polars. The only accessory to the IR microscope was a motorized stage; a standard detector was used. Each mapping run required less than an hour.

Results clearly showed effects of damage to the polymer tape support material that could be correlated with distance from the torn edges. In regions of the tear, complete disruption of the pseudo- crystalline polymeric structure was evident in the infrared spectrum obtained under crossed-polars. Selected peaks in the spectrum were identified as markers of structural damage and signs of such damage were evident in the infrared spectra before the damage was visually identifiable. Patterns were also noted across tears. Results of this study could be used to supplement physical matching of tape and would be particularly useful in cases where tape edges are so badly damaged that visual matching methods are problematical.

Tape Evidence, Infrared Microscopy, Polarized Light Microscopy

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