I. SCOPE

When tape is received as evidence, a multi-disciplinary approach must be considered. Latent print examiners, trace evidence analysts, and scientists from any other discipline involved should work together to devise a scheme of analysis so as to glean as much information as possible for all disciplines. The initial examiner may examine the tape for trace evidence or the tape could be transferred to a trace evidence examiner for examination and recovery of any trace evidence on the tape. Prior to latent print processing, a sample of tape (approximately one inch in length) may be removed from a portion of the tape which will be least likely to contain fingerprints. Care should be taken when processing the ends of the tape to minimize damage to the torn ends preserving the ends for a possible physical match. If tape needs to be cut from an item, any cuts made by an examiner should be made and/or labeled in such a way as to be easily recognized (e.g.: zigzag cut, exaggerated angle cut).

Quite frequently, the glue/adhesive/sealant/filler material (hereafter simply referred to as "adhesive") will not be inventoried as a separate item, but will be a component of an exhibit being examined. Adhesives should be examined for the inclusion of trace evidence on or embedded in the adhesive.

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Study Guide contain reference lists, which include instrumental analyses of polymers.

Validation
The techniques described below for PST and adhesive examination are well known and scientifically accepted in the forensic community and in private industry. Relevant examples of related literature can be found in Section II (References)

III. SAFETY CONSIDERATIONS

Standard Laboratory Safety Practices will be followed when handling any physical evidence. The examiner should follow all the biohazard procedures and use universal safety precautions.

IV. APPARATUS/REAGENTS

1. Tweezers, scalpel and other appropriate tools.
2. UV light
3. Appropriate solvents (chloroform, toluene, etc)
4. Micrometer and other measuring devices
5. Polarized light microscope
6. Glass microscope slides and coverslips
7. Mounting media
8. Camera or other Imaging Equipment
9. XRF or SEM/EDS
10. XRD
11. FTIR
12. Pyrolysis GC-MS
13. High Temperature GC/MS

Standards and Controls

Instruments used must be tuned and performance checked and adjusted as applicable. Appropriate standards, controls, and blanks will be utilized as needed per the trace evidence instrumental protocols.

V. PROCEDURES

A. Physical Match for PST and adhesive particles

Please refer to TE10 – Examination of Physical Match PPG.

B. Chemical Analysis for PST and adhesives

PURPOSE

Chemical analyses are performed on PST and adhesives, to aid in the identification of the source and/or for comparison between PST and adhesives.

MINIMUM STANDARDS AND CONTROLS

1. The examiner must clean the examination area and/or change the examination paper (using separate examination rooms if possible) between questioned and known samples and when it seems appropriate.
2. The examiner must clean their tools between samples.
3. If at any time during the comparative scheme of analysis a significant or unexplainable difference is observed between the Q and the K samples, no further examinations need to be conducted and the tapes or adhesives can be reported as being dissimilar to one another.

Sampling / Sample Selection:

Each recovered piece of questioned tape or adhesive should be examined unless the number of pieces makes this procedure prohibitive. In that case, a representative sample may be taken for further analysis. Because different / separate tape or adhesive pieces cannot be assumed to be from the same source, sample selection should be utilized when reporting the isolation of questioned samples.

When testing individual questioned pieces of tape or clumps of adhesive, certain tests may be conducted on smaller samples which are removed from that larger piece or clump. In that instance, homogeneity is assumed and sampling may be utilized. Accordingly, the results of those tests may be used to represent the larger piece (or pieces that have been physically matched together) as a whole.

It can be assumed that the known tape from a roll or known adhesive from a tube is homogeneous and therefore sampling can be utilized when known samples are mentioned in reports.

ANALYTICAL PROCEDURES

TAPES

1. Vinyl Tape (i.e.: Electrical Tape)

a) Physical characteristics such as color of backing and adhesive, width, and thickness of the tape may be determined.

b) The texture of the backing should be examined by light microscopy or scanning electron microscopy and documented. This examination should be done on the most unaltered area of the sample(s). The lighting,

magnification and orientation must be consistent between samples.

c) The thickness of the tape may be measured if appropriate.

d) Both the tape adhesive and backing portions of the tape should be analyzed using appropriate analytical methods for evaluating both the physical and chemical components. These methods may include PLM (backing and adhesive) SEM/EDS and/or XRF (backing and tape adhesive), FTIR (backing and tape adhesive), PyGC-MS (backing and adhesive) and High Temperature GC/MS or FTIR (analysis of plasticizer of the solvent extract of intact tape).

e) A cross section of the backing may be done and the fillers/pigments characterized using the PLM and/or SEM-EDS.

2. Duct tape

a) The color of backing and tape adhesive, width and thickness (with and without adhesive) of the tape may be determined.

b) The texture of the backing will be microscopically examined. This examination should be done on the most unaltered area of the sample(s). The lighting, magnification and orientation must be consistent between samples.

c) Examine the yarn and a count of the scrim (the yarns contained in one square inch of tape) should be done if possible. The first number by convention is the warp. These are the yarns that run in the machine direction (along the length). The fill (or weft) runs perpendicular to the length of the tape. In addition to obtaining the count, the yarns will be described as to their construction and their composition. If necessary the scrim can be removed by peeling away the tape adhesive or by dissolving the adhesive in toluene, chloroform or other suitable solvents.

d) The tape adhesive may be examined with a UV light

e) A cross section of the backing should be done and viewed using the PLM. If the backing is multilayered, an FTIR analysis of each layer should be performed if possible.

f) The tape should be analyzed using appropriate analytical methods for evaluating both the physical and chemical components. These methods may include SEM/EDS and or XRF (tape adhesive and backing), PLM (tape backing, adhesive and fibers), PyGC-MS (tape adhesive), FTIR (tape adhesive, backing layer/layers and fibers), and XRD (adhesive).

3. Other tapes

a) The color of backing and adhesive, width and thickness (with and without adhesive) of the tape may be determined.
b) If fibers or fabric are present, examine the fibers per PPG TE11 – Examination, Analysis and Comparison of Textile Fibers.
c) Examine the adhesive and backing using appropriate analytical techniques as described above.
d) Adhesives may be examined using the PLM to identify certain components and fillers.
e) Clear tapes may be examined by PLM in order to determine if they are MOPP/BOPP films.

ADHESIVES

1. If dried adhesives are to be compared with liquid materials from a tube or bottle, a known comparison standard sample should be prepared by mixing the sample, if necessary, applying a portion of the sample to a clean glass slide and allowing the sample to thoroughly dry/cure. In some instances (such as with moisture cure adhesives) the adhesive may need to be placed in a moist environment and may need to be heated to facilitate complete curing. Ensure that the sample is protected from any dust or contamination while it is being cured.
2. Adhesives should be first examined using a stereomicroscope. Physical characteristics such as color, hardness, texture, solubility properties, elasticity, porosity, opacity, and reaction to UV light should be noted.
3. A small sample of the Q and K adhesives may be examined using the polarized light or comparison microscope. Fillers and other components may be identified or described.
4. Obtain FTIR spectrum of the adhesive and compare the spectrum obtained with reference spectra.
5. Elemental analyses such as XRF and/or SEM-EDS can be performed.
6. Other analytical techniques such as P-GC or PGC-MS, PLM, and XRD may be utilized in the characterization of adhesives.

VI . QUALITY ASSURANCE

Through proper training and competency testing of PST and adhesive examiners as well as through the use of high quality equipment which is appropriately cleaned, maintained and quality checked (e.g.: calibrated, performance checked) the quality of this method is assured.

Because PST and adhesives are mass produced, a questioned tape or adhesive can never be

positively identified back to a specific source (short of a physical match); therefore, the use of error rated is not applicable.